PC MAGAZINE

Hands on iPad Pros, iPhone 6s, Apple TV

DIGITAL EDITION
OCTOBER 2015

PC MAGAZINE

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Cover photo courtesy of Apple, illustration by James Jacobsen

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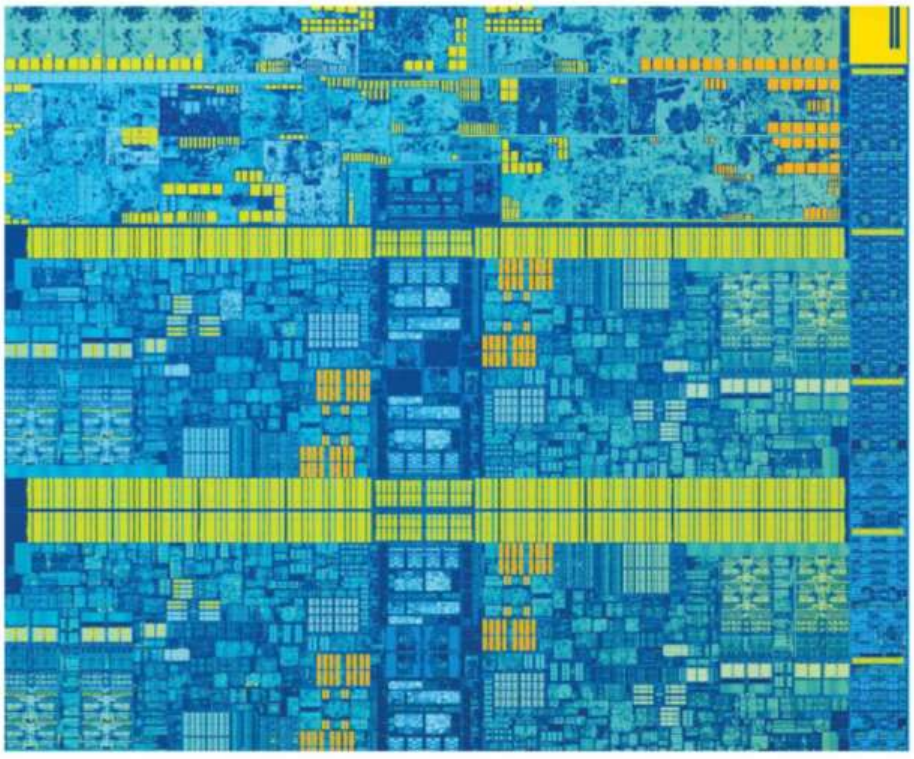

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THE FASTEST ISPS OF 2015

These are the companies you should check out if you want the fastest Internet speeds—no matter where you live.

Matt Damon in *The Martian*

Photo credit: Aidan Monaghan

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> We may as well give up and let the authorities "chip" us like cattle. At least we'll know where we stand.
>
> **JOHN C. DVORAK**
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DIGITAL LIFE

DAN COSTA

Being First vs. Being Best

Just a few weeks ago, I got the chance to attend one of Apple's trademark launch events in San Francisco. I've been to more than a dozen of these over the years, and this one had all of the hallmarks: a line to get into the building, a line to get into the auditorium, a mad scrum to find a seat with power and decent line of sight for photography. At the end of the day, Apple refreshed a bunch of products: a new iPhone 6s, Apple TV, watchOS 2, tvOS, iOS 9, and a huge new iPad Pro. Dig into the details and a lot of these improvements are only incremental, which led a lot of journalists, including some on *PC Magazine*'s staff, to call the event a failure. I think that's a mistake.

One of the coolest new features demoed at the event was Live Photos. Take a picture with a new iPhone 6s and the phone will capture a Live Photo by default. You'll still get a still snapshot, but the camera will also capture the image and audio of a brief period before and after you press the shutter button, with the final effect being something akin to a 3-second video. Apple refuses to call it that, of course, but what else do you call moving pictures with audio?

The effects will double the size of your images, but Live Photos are undeniably cool. As I was gushing over it to *PC Magazine*'s lead mobile analyst, Sascha Segan, he rolled his eyes. "It is HTC's Zoe," he said dryly. That's right: HTC offered pretty much the same feature on its One M7 way back in 2013. I had no idea. Obviously, it didn't catch on.

My naïveté aside, there is nothing wrong with

this. Apple didn't invent Live Photos, but it will make the idea work where HTC couldn't. Zoe videos could only be viewed on the HTC One M7. Live Photos can be viewed on any device running iOS 9 or the latest version of Mac OS. Plus, Apple is working to make Live Photos viewable in your Facebook newsfeed by the end of year. Where should we give the credit, for the invention or for making the invention work?

Or take the case of the Apple TV. Apple started selling it way back in 2007, making it one of the earliest streaming TV players. Since then, the product has languished a bit, falling behind Roku, Amazon Fire, and Google Chromecast in terms of sales. It's also lost a step in terms of technology: The Amazon Fire Stick has had voice controls for more than a year. Apple wants to turn that around with the new Apple TV, which comes with a cleaner interface, better hardware, and Siri integration. Some may think this is too little too late. *PC Magazine*'s consumer electronics guru, Will Greenwald, put it pretty succinctly in his story titled "The New Apple TV is Late to the Party" (which you can read in the Opinions section).

Will is right. Despite being one of the first products to deliver streaming video to the living room, the Apple TV is playing catch-up. Apple doesn't care. There isn't much revenue in this space, and the marketing is still split among Amazon, Google, Roku, and game consoles. Now Apple has better hardware, a cleaner interface, and a voice-based assistant in the living room. Apple doesn't want to be first, it wants to be *last*.

This is an "S" year for the iPhone, which means the iPhone doesn't change much. Indeed, unless you spot the model with the new "rose gold" color, there's no difference from the iPhone 6. Even so,

> **When Apple gets something right, it tends to stick with it. That's why the iMac and MacBook Air haven't really changed in years.**

Apple has added some new features here, too. What the company calls 3D Touch is pretty much the same thing as Force Touch on the MacBook: Push down hard and you can trigger actions that are different from what you get with a simple tap. It works and does a lot to maximize the utility of a phone's small screen. Apple also bumped up the camera resolution to 12 megapixels and added a screen-based selfie flash to the rear-facing camera. Plus, Apple claims the 6s' new A9 processor is 80 percent faster than the A8. Not bad for an "S" year.

To understand Apple's kind of innovation, you need to step back and look at how the pieces fit together. When Apple gets something right, it tends to stick with it. That's why the iMac and MacBook Air haven't really changed in years. The iPhone form factor is settling into the same pattern. That said, the platform keeps moving forward. The new and improved Apple TV is going to be a boon for Apple Music. Consumers will be able to use a Siri-enabled Apple TV to navigate Apple Music's vast catalog directly from the sound system connected to their HDTV. It's those second-order benefits that keep Apple ahead.

As a gadget guy, I love new hardware as much as anyone else. But these days, the most interesting innovation is happening inside these devices, and, just as important, in the data-filled gaps in between our devices. Apple gets that.

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Data-ing Game

After finally upgrading to Windows 10, I feel like it is best for me to start backing up my laptop. What would be the best way for me to go about this?
—Ethan Brown

OUR ANSWER:

The best way to back up your data is whatever way you'll stick to, because a backup that isn't current is not much better than no backup at all. Luckily, most backup methods today are easy to configure and almost entirely hands-off.

One good free tool is part of Windows 10. File History (search for it either by asking Cortana, or typing it into the Search field in the taskbar) keeps a record of multiple versions of your files, so you'll always have the one you need. Connect an external hard drive to your laptop, turn on File History, and you're set. (If you don't specify files and folders, Windows will back up your entire User folder.) If you need an external hard drive for File History, a good, affordable option is the LaCie Fuel: It uses USB 3.0, and is available in 1TB and 2TB capacities (priced at $179.99 and $229.99, respectively).

Another method: an online backup and file syncing service, which will constantly monitor your files and save new versions in the cloud. Not only do you not have to worry about something happening to your computer, you don't have to worry about something happening to your local backup. Our Editors' Choice winners are IDrive ($59.50 per year for 1TB) and SOS Online Backup ($79.99 per year for unlimited storage).

—Matthew Murray, Managing Editor of Digital Editions

Ask us a question!

Have a question about a story in *PC Magazine*, one of the products we cover, or how to better use a tech product you own? Email us at **letters@pcmag.com** and we'll respond to your question here. Questions may be edited slightly for content and clarity.

What's New Now

INSIDE INTEL'S "SKYLAKE" MICROARCHITECTURE

THE FASTEST ISPS OF 2015

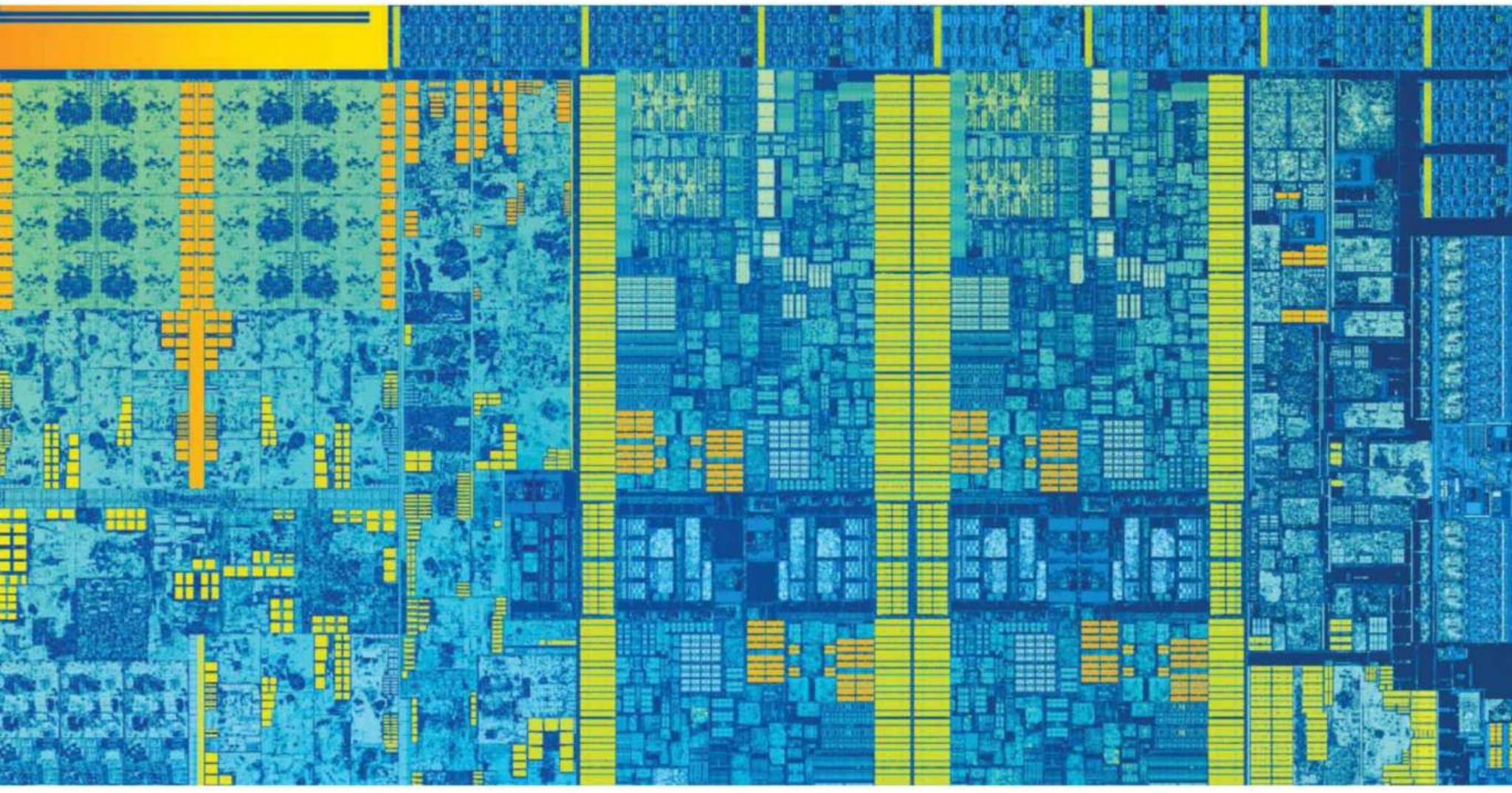
VIETNAM'S TECH BOOM

CHAT: RIDLEY SCOTT MEETS *THE MARTIAN*

TOP GEAR

Inside Intel's "Skylake" Microarchitecture

BY MATTHEW MURRAY

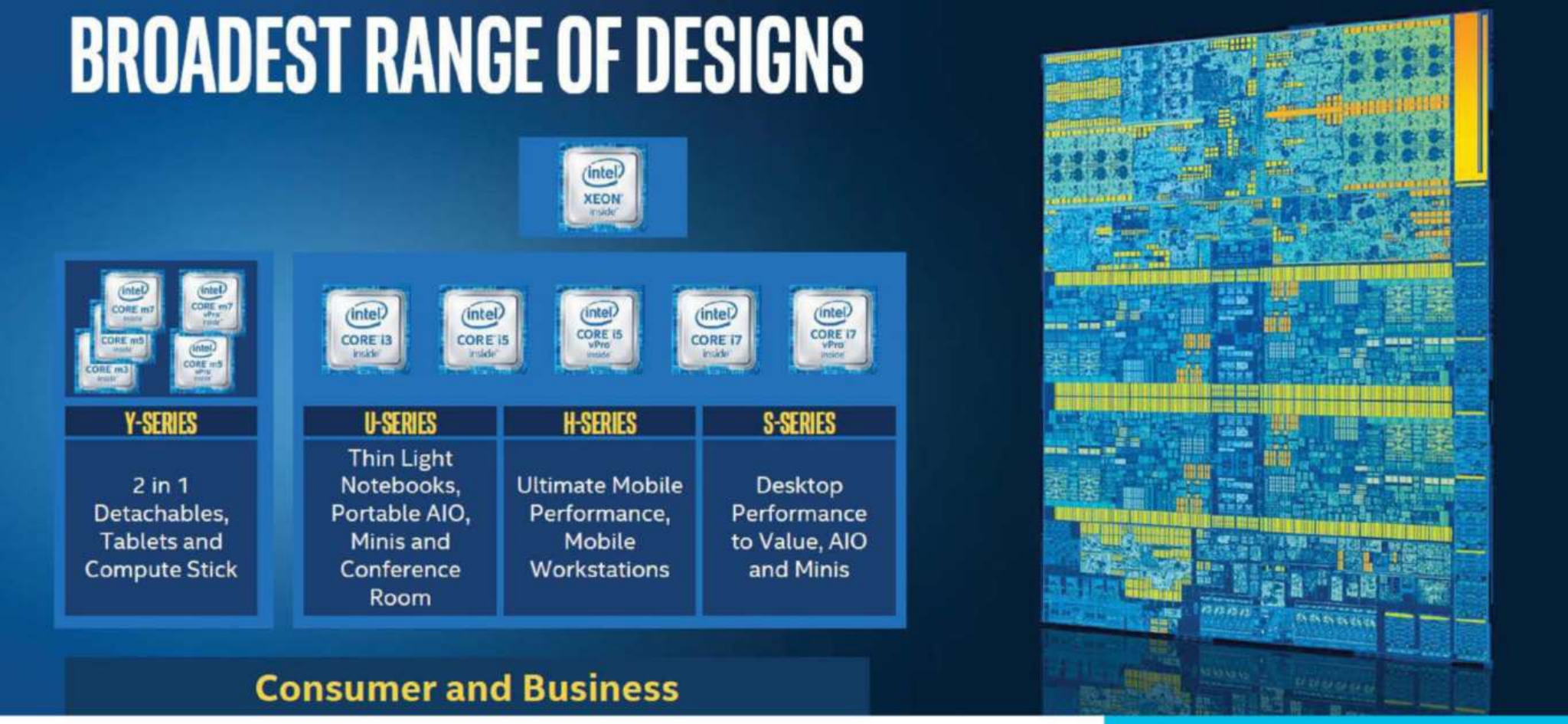


All photos in this article are courtesy of Intel

Intel's 6th Generation Core microarchitecture, also known by its development code name "Skylake," made its official debut at Gamescom in August, with the release of the high-end Core i7-6700K and Core i7-6600K desktop chips. Now Intel has unveiled the full details of how chips using the Skylake design fit into its lineup as a whole, and told us more about what we can expect from this series of CPUs intended to work in everything from go-anywhere tablets to rooted-in-place desktops. Here's what you need to know about Skylake.

SKYLAKE MIXES UP THE FAMILIES

The complete roadmap for Skylake begins in the Y-Series, which is intended for use in two-in-one convertible machines, tablets, and the Compute Stick. Next up the line is the U-Series, aimed at thin-and-light notebooks, portable all-in-



one desktop systems, and other miniature and conference room applications. The top of the line for mobile is the U-Series, which will be used in high-end gaming laptops and mobile workstations. Desktops own the entirety of the S-Series. (There are also the Xeon workstation chips, which are more or less their own category.)

One significant change in branding is coming for the tablet-minded Core m processors. They will now follow a naming structure similar to that of the standard Core chips: Core m3, Core m5, and Core m7, with the same general meaning as far as performance characteristics as the Core i3, Core i5, and Core i7 releases (the bigger the number, the more powerful the CPU). Intel claims this is to acknowledge the presence of and allow for the greater range of applications in which the Core m chips have been used since their debut last year.

HIGHLY EXTENDABLE
Processors using the new Skylake design may appear in any kind of system, from the energy-efficient convertible tablet to the most powerful gaming desktop PC.

SKYLAKE BOASTS IMPROVED PERFORMANCE, PARTICULARLY ON MOBILE

It wouldn't be a new Intel microarchitecture launch without a boost in performance, and Skylake delivers that. As Intel's new mainstream line, Skylake can include chips with either two or four cores, and that can take advantage of Hyper-Threading to respectively ratchet up to either four or eight threads (though this does not apply to every chip).

Skylake's new performance comes from a variety of sources, such as the adoption of technologies that naturally prove speedier in certain applications. Yes, you get the expected notched-up chipset I/O throughput, as well as nods to

more familiar technologies like DDR4 memory (which Skylake supports alongside low-voltage DDR3L, as if admitting that DDR4 isn't yet quite ready for everyone) and PCI Express 3.0 (which gets an increased number of lanes in Skylake). But there are also things like embedded DRAM (eDRAM) memory; a new cache architecture called a "memory side cache" is designed especially for it, making the eDRAM fully coherent and allowing for faster C-state transitions. In addition, eDRAM may now be used in either 64MB or 128MB configurations, so it's more useful in more systems.

Mobile is where you see the biggest performance jumps with Skylake, as Intel itself admits. The company touts Skylake mobile CPUs as delivering up to 2.5 times faster processing performance, 30 times better graphics performance, and three times the battery life of earlier-generation chips. (This is comparing the Skylake-based Core i5-6200U with the Westmere Core i5-520UM from 2010.)

Desktop gains are more modest. When comparing the new Core i5-6500 to the older Core i5-650 (again from 2010), Intel points to 60 percent better processing performance, six times faster 4K video transcoding, and 11 times better integrated graphics performance. Bad? No, of course not. But for itchy-fingered upgraders, desktop Skylake doesn't present as compelling a story as we've seen from Intel's desktop chips in the past—another sign of how the chip world is rapidly moving away from the segment that has traditionally been its power king.

Mobile is where you see the biggest performance jumps with Skylake.

SKYLAKE EMBRACES NEXT-GENERATION GRAPHICS TECHNOLOGIES

Like its processing side, Skylake's integrated graphics system was also conceived to be scalable. The Intel HD Graphics 500 system (which Intel also sometimes refers to as its "Gen9" graphics) is currently divided up into four configurations for consumer mobile: 510 (used

only in U-Series Pentium processors), 520 (U-Series Core i3, i5, and i7), 530 (all H-Series processors), and 540 (scattered usages in the Core i5 and Core i7 U-Series chips).

HD Graphics 500 will deliver some features that users will appreciate, such as better frame rates when using MSAA, larger caches for feeding the GPU, more back-end fill rate capabilities, and lossless color compression. Although these won't translate to huge improvements in, say, gameplay applications, any little bit helps. (It's also worth pointing out that any desktop or laptop user could effect the biggest change on graphics performance by getting a system with discrete video processing from either AMD or Nvidia. HD Graphics may suffice for standalone computing, but plunk down a smidgen of extra cash and you can do a lot better.)

Also supported are other graphics technologies, many of which are in line with those that have been introduced in Windows 10, such as DirectX 12, OpenCL 2.0, and OpenGL 4.4, though Intel also touts new HEVC/H.265 encoding and decoding, as well as a better, lower-power H.264 encoder.

Intel's primary focus, at least as far as selling Skylake as a practical solution to the public, has to do with 4K. No, 1080p is no longer good enough, and single-4K processing is old hat. Skylake chips can drive up to

OVERCLOCKING INNOVATIONS

For laptop users who can never get enough power from their processors, Skylake chips also have a special eye toward overclockability. The quad-core 2.7GHz Core i7-6820HK is the first mobile CPU with an unlocked multiplier, so either manufacturers or end users can tweak a chip's performance to the extent of their patience and their laptop's cooling abilities.

One note for desktop lovers: At IDF, representatives from both Intel and ASRock demonstrated how it's possible to take the 4GHz Core i7-6700K to nearly 7GHz, so you don't need to be left out of this, either—assuming you have enough liquid nitrogen to cool the chip, of course.

TRIPLE PLAY
One of the big showcases at the Intel Developer Forum in San Francisco in August was this amazing gaming setup, which Intel claimed showed Skylake's graphics prowess delivering video to three 4K displays.

three 4K monitors at once, and transcode a 4K video up to 20 percent faster than one of last year's Broadwell chips. Although user 4K adoption is still struggling a bit to gain traction on the PC side (as on the TV side), as it becomes less expensive and content using it becomes more plentiful, this has the potential to be a boon, most notably for laptops.

SKYLAKE OFFERS SUPERIOR POWER EFFICIENCY

Any microarchitecture designed for devices as tiny as tablets as well as systems as towering as gaming desktops needs to be able to marshal incredibly varying amounts of power. That's exactly how Intel has approached Skylake. At the low end (the Y-Series), chips using the microarchitecture need only 4.5 watts. At the opposite end of the spectrum (for Xeon workstation CPUs), they can use as much as 91 watts. This ability comes from a number of sources baked into the design, chief among them a new power management scheme is calling "Speed Shift Technology." Speed Shift adds new power domains (System Agent and eDRAM I/O) and gives the hardware more control than ever over power states and the process of transitioning between them, so the system can use less energy in the whole process. Previously, hardware only controlled the chip's base and Turbo Boost frequencies, and trusted everything else to the operating system. No longer.

Where has all this led? Intel claims that its mobile Skylake chips run up to 60 percent faster and use up to 60 percent less active power than earlier CPUs, with a laptop equipped with a Core m7-6Y75 processor and a 38Wh battery capable of playing a 1080p video for up to 10 continuous hours.

SKYLAKE WAS DESIGNED FOR USE WITH WINDOWS 10

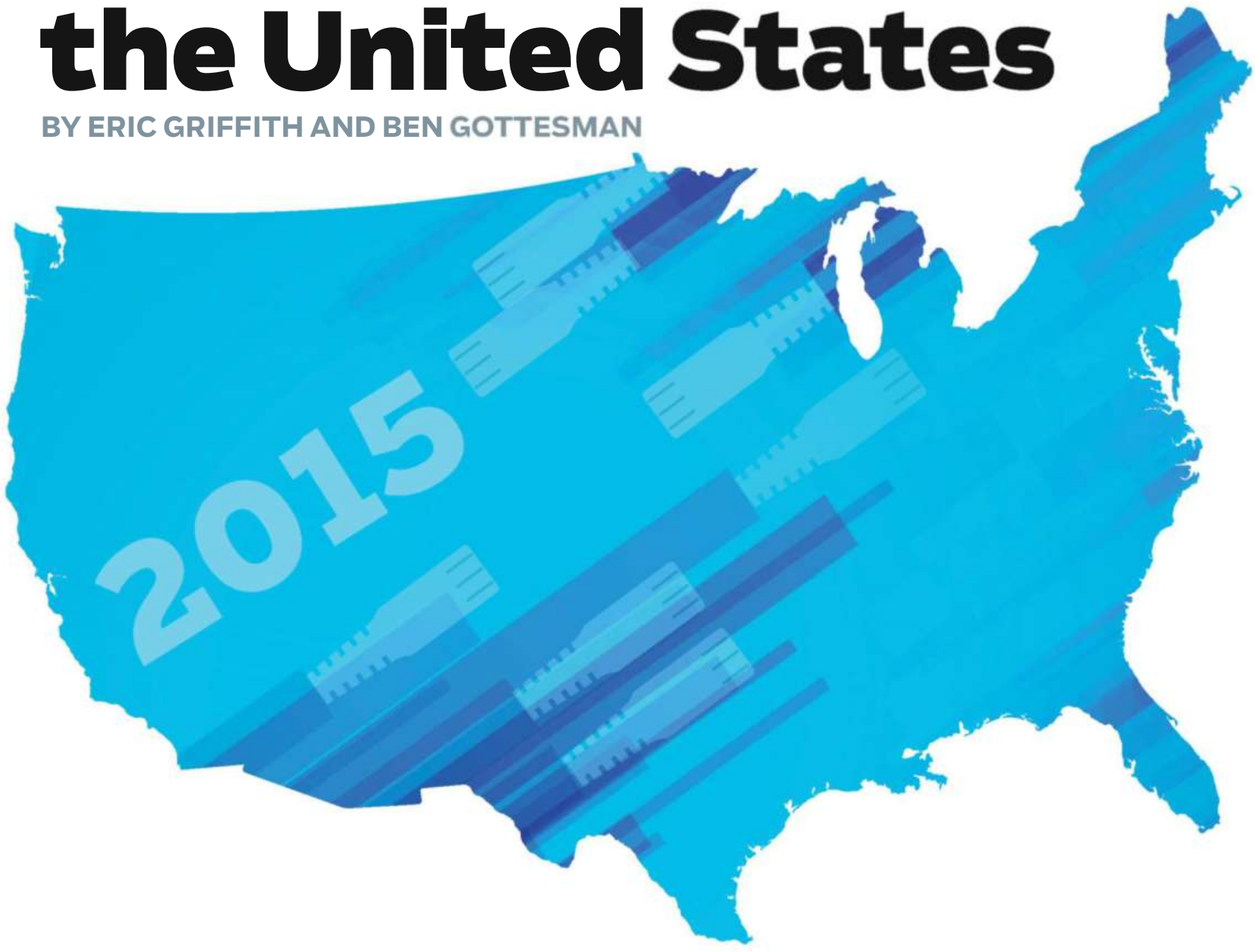
You don't hear the "Wintel" moniker quite as often these days as you used to, but it remains very much in force in many computer users' minds. During the Windows 10 sessions at IDF, the relationship was still heartily played up, with many of Skylake's innovations positioned with regard to the impact they would have on the Windows 10 experience.

Skylake, for example, supports hardware offloading for voice activation, something that could be significantly helpful when taking advantage of the Cortana digital assistant in Windows 10, which allows for the integration of a hardware "keyword spotter" based on a digital signal processor (DSP) "keyword spotter." Or Windows Hello, the operating system's new advanced authentication system, which almost seems designed to work hand-in-hand with what Intel's RealSense cameras can do. And in case you think that power management is strictly a Skylake feature, Windows 10 takes a crack at it, too, with a new Modern Standby power state that doesn't involve Wi-Fi and pings software considerably less often; supposedly, devices can last nine days or so in this state (called Disconnected Standby, the next logical step after the Connected Standby introduced in Windows 8.1).

Intel claims that its mobile Skylake chips run up to 60 percent faster and use up to 60 percent less active power than earlier CPUs.

The Fastest ISPs in the United States

BY ERIC GRIFFITH AND BEN GOTTESMAN



When we first kicked off the Fastest ISPs series in 2010, our winner, Verizon FiOS, had a "blazing" speed of 1.23Mbps. By 2012, that had risen to 29.4Mbps, and it's only gone up since: 34.5Mbps in 2013 and almost 55Mbps in 2014. That's some stellar improvement in five years (especially for a service that won't expand its established customer footprint). Many other fiber and cable providers are keeping up when it comes to speed and attracting new customers, as local and giant megalithic corporations keep everyone competitive. (Not merging also helps.)

For ISPs, that's what it's all about: growth in speed and footprint. There are more and more municipalities with ISPs providing Gigabit connections—that's over 1,000Mbps down. At least one, Salisbury, North Carolina, claims the title of the country's first 10Gb city. Nationally, the U.S. is a long way from having

average speeds as good as those seen in South Korea and a few other countries, but with (mostly) smaller players laying the fiber-optic ground work, Internet speeds are at least trending in the right direction.

We know it will upset some of you to not see your own ultra-mega-speedy broadband ISP in the following pages. There's a good reason for that. We had to establish minimum cutoffs on the number of tests and locations to make sure the results were statistically valid—otherwise, one or two tests could establish the "fastest ISP." For example, this is the first year we've had enough data to include Gigabit broadband darling Google Fiber at all. But because it's only found in three cities, it didn't qualify for the national list, only the regionals. That said, look carefully at smaller, local companies when you go shopping for broadband—they can frequently surprise you with all the features they'll bring to the table in their quest to upstage the major-name ISPs.

These results mostly reflect big name cable and fiber-optic providers. Most of the wireless and even satellite-based ISPs simply can't make the cut. Even DSL can barely compete now.

THE FASTEST ISPS

Remember when we said that ISP speeds are improving in the U.S.? Here's the proof. Compare the numbers from last year to this year and you can easily spot the upward trend. Every single ISP that made the top 10 for "all ISPs"—those with at least a minimum of 100 tests—had higher Speed Index ratings this year. That corresponds directly to having faster download and upload speeds.

No ISP shows improvement quite like Midcontinent Communications (Midco). The South Dakota–based ISP is in its second year as our fastest ISP for the nation with a stunning index of 84.6. That's the kind of number we see in Asian countries, and it's a major improvement for Midco, which last year had an index of 46.8. If you live in the Dakotas, Minnesota, or Wisconsin, you need Midcontinent Communications. Some of its locations already have Gigabit service; Midco says Gigabit over cable (using DOCSIS 3.1 modems) is coming in some areas areas by 2016.

Next on the list—and the top "major ISP" with multistate services (and more than 1,000 test results across multiple states)—is the old stalwart of fiber-to-the

home (FttH) deployment in the U.S., Verizon FiOS. It once again improved its Speed Index, shooting up to 42.7 from last year's 32.8. And as noted before, FiOS has made speed improvements every single year since 2010. (FiOS also remains the top-rated ISP with *PC Magazine* readers for its service and reliability.) having earned our Readers' Choice award ten years in a row.)

FiOS is certainly fast, but its lead on the major cable-based operators is not vast. Comcast—the largest cable company (by revenue) and therefore the largest Internet provider with service in 40 states—isn't always well loved. But its Xfinity brand for broadband service is undeniably fast, with an index of 38.9. Plus, Xfinity sports a faster average download speed (46.1Mbps versus Verizon FiOS's 42.9). FiOS's almost symmetrical upload speed (41.7Mbps) is what keeps its Speed Index ahead of Xfinity.

Optimum Online, the residential Internet arm of Cablevision, is also up there with an index of 36.9 (assisted by the second-fastest upload speed among major ISPs at 20.2Mbps). Cablevision/Optimum serves the New York tri-state area and Pennsylvania, having sold off its other holdings to Charter Communications (number four among major ISPs) in 2013. Charter's Spectrum Internet offers service in 29 states.

Amid all ISPs, you'll see "smaller" companies like West Coast–based Wave Broadband, the return of Bright House Networks, and CCI (aka Contact Consolidated, which acquired SureWest). Notice in major ISPs a big drop between Time Warner Cable's respectable nationwide (29 states) index of 30.9 and privately owned Mediacom Cable's plunge to 24.1 in its 22 states (plus D.C.). The major top ten ends with AT&T U-verse, the provider's fiber-to-the-premises (not quite to the home) solution that's one of the few domestic fiber installs that rivals FiOS in footprint—yet it tends to pale in execution. RCN, our Readers' Choice winner from earlier this year, landed at number 13 on the list.

THE FASTEST ISPS (ALL)

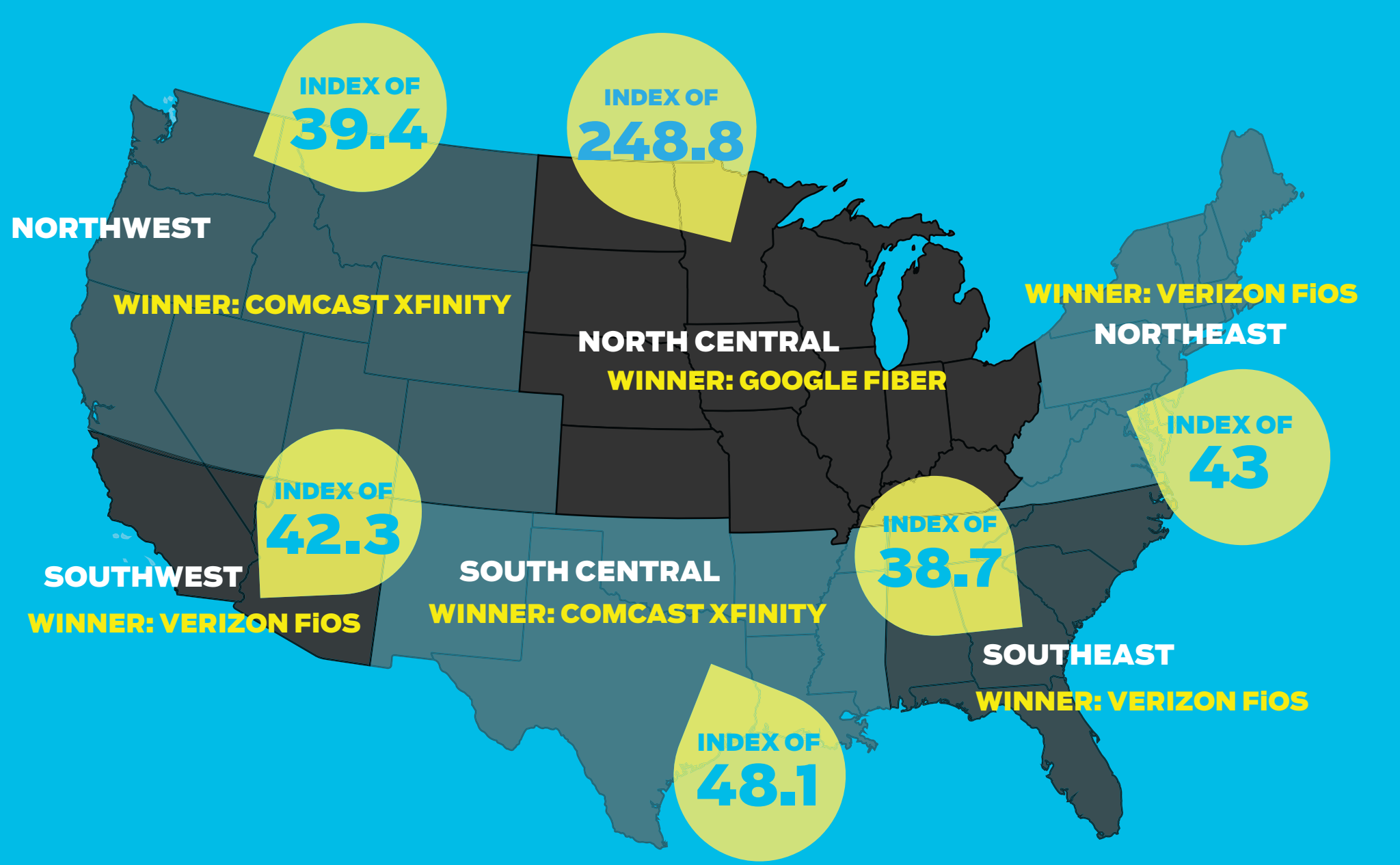
Midcontinent Communications (84.6)
Verizon FiOS (42.7)
Comcast Xfinity (38.9)
Optimum Online (36.9)
Wave Broadband (33.7)
Charter Spectrum (32.9)
Bright House Networks (32.8)
Cox Communications (32.1)
Time Warner Cable (30.9)
CCI (26.0)

THE FASTEST ISPS (MAJOR)

Verizon FiOS (42.7)
Comcast Xfinity (38.9)
Optimum Online (36.9)
Charter Spectrum (32.9)
Cox Communications (32.1)
Time Warner Cable (30.9)
Mediacom Cable (24.1)
Suddenlink (20.7)
CenturyLink (12.1)
AT&T U-Verse (10.7)

FASTEST ISPS BY REGION

It's one thing to say an ISP is the fastest nationwide, but that doesn't have much impact on the market in which you live. Chances are, you probably have one provider available, or two if you're lucky. That's why we also narrow things down into six areas of the domestic U.S., so you'll have a better idea of which IS the best fit and more likely to be available near you. (The exception to this rule remains satellite providers, such as HughesNet, which is currently delivering 4Gen, or Wildblue's Exede service. Both rank so low on the speeds that they can barely compete with DSL, and have so few customers that they don't make the top ten of any of our regional breakdowns, as they don't receive enough tests to be included.)



#10 NEW JERSEY
INDEX OF 37.3

#9 NEW HAMPSHIRE
INDEX OF 37.6

#8 UTAH
INDEX OF 37.6

#7 PENNSYLVANIA
INDEX OF 39.2

#6 MARYLAND
INDEX OF 39.8

#5 MISSOURI
INDEX OF 41.0

#4 MISSISSIPPI
INDEX OF 45.8

#3 DELAWARE
INDEX OF 47.9

#2 NORTH DAKOTA
INDEX OF 48.4

#1 SOUTH DAKOTA
INDEX OF 94.9

THE U.S. STATES WITH FASTEST INTERNET

If you pick where you live based on the Internet connection, well, we envy you that freedom! But it also gives us a chance to tell you where to go, literally. (For the best speeds, of course.) We have a ranking for every state except Alaska—hey, Alaskan *PC Magazine* readers, take our speed test!

Which is the fastest state? Last year, by a hair, it was South Dakota. This year, by a massively wide margin—as in, double the speed of the next fastest state—is, again, South Dakota! The average Speed Index among all the ISPs tested in South Dakota is 94.9. That's bolstered, no doubt, by the services offered by our fastest ISP, Midcontinent Communications. The same goes for North Dakota, in second place with an index of 48.4. If that seems paltry in some ways, keep in mind that 48.4 is higher than what South Dakota got last year. In fact, the top four states this year all have higher indexes than the top state last year.

In third place is the First State, Delaware, which has been in the tops of state-wide Internet speed for a long time in our Fastest ISPs studies, going back to 2011. Delaware's top ISP: Comcast Xfinity with an index of 55.0.

The past couple of years we were impressed especially with how the District of Columbia handled its Internet—it was the fastest "state" in 2013, and a very close second in 2014. But this year, D.C. took a nose dive, with the average speed there dropping to a Speed index of only 31.7, low enough to land D.C. at number 18 on the list of states. That's a big disappointment after last year earning a 42.9. The highest indexing ISP for D.C. is Verizon FiOS with a 32.6.

Of the remaining top 10 states, the majority are led in the ratings by either Comcast Xfinity (Delaware, Mississipi, Utah, New Hampshire) or Verizon FiOS (Maryland, Pennsylvania, New Jersey). Missouri gets a big boost to its average thanks to Google Fiber (with an index of 232.7!) in Kansas City.

#10 LOVELAND, CO
INDEX OF 60.3

#9 METAMORA, IL
INDEX OF 60.5

#8 KANSAS CITY, MO
INDEX OF 65.7

#7 STATEN ISLAND, NY
INDEX OF 66.1

#6 BEDMINSTER, NJ
INDEX OF 66.6

#5 STERLING, VA
INDEX OF 66.7

#4 LAKE WORTH, FL
INDEX OF 81.5

#3 KANSAS CITY, KS
INDEX OF 87.7

#2 ALEXANDRIA, VA
INDEX OF 112.4

#1 SIOUX FALLS, SD
INDEX OF 125.7

THE U.S. CITIES WITH FASTEST INTERNET

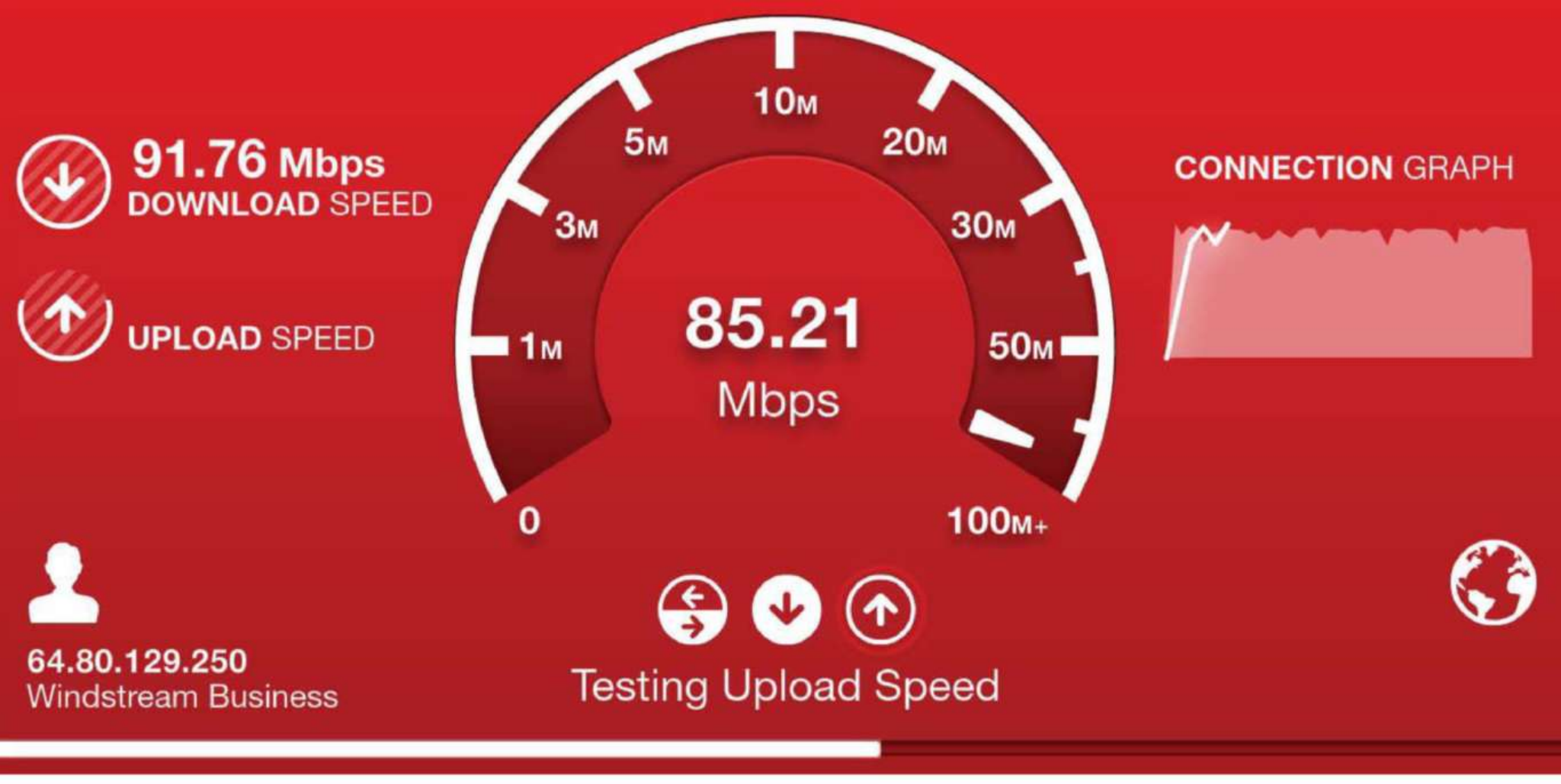
When it comes to the top ten fastest cities, keep in mind that the cities have to meet our minimum threshold of tests—but that's it. Our Speed Index number for a city includes results from all the local ISPs, big and small, fast and slow.

If you're paying attention, the city of Sioux Falls, South Dakota, getting the title of fastest city will surprise you not one bit. Midco calls Sioux Falls home, and Midco's speeds are amazing.

Last year, Washington, D.C., was the leader on the list of cities, but this year it dropped down to 34th place. And unlike with D.C. in the states list, that's with an *increase* in speed, from 2014's index of 40.8 to 43.6 this year. That's nice, but doesn't keep up at all with the average speed increases happening in other cities. Verizon FiOS and Comcast Xfinity are both available in the capital city, as is RCN, but so are a lot of government-backed connections with which the average at-home connection can't compete.

Alexandria, Virginia, came in second on the cities list last year and this year. But the jump in speed from 38.7 to 112.4 is stunning, coming from the strong performance by Verizon FiOS.

Kansas City makes the list of top cities twice, in the major metro area in Missouri (eighth place with an index of 65.7) and the western side of town in Kansas (in third with index 87.7). Both benefit from the presence of Google Fiber. A surprise fourth place finish goes to the small town of Lake Worth, Florida, near West Palm Beach and Boca Raton, which it owes to a strong showing in town by Comcast Xfinity.



METHODOLOGY

The results in this article were taken from 80,772 individual tests completed from September 1, 2014 to August 28, 2015 at pcmag.speedtest.net and on our website, pcmag.com. Speedtest collected download and upload speeds for each test, measured in Megabits per second (Mbps). We used those results to calculate an index score for a better one-to-one comparison, where downloads count for 80 percent and uploads 20 percent. For an ISP or location to be included in results, we required a minimum of 100 tests.

Speedtest.net requires only a Web browser running Adobe Flash and JavaScript to work. On the back end, Speedtest.net performs a “fill the pipe” test. Rather than testing the upload and download speeds of a single file, it uses multiple broadband threads (the broadband applications that can be used by a browser) to measure the total capacity of the “pipe.” This leads to numbers higher than some other Internet speed tests out there, sometimes even higher than the rate of broadband speed you are paying for.

A note about PowerBoost: This is a marketing term used by Comcast to describe a common cable technology that ramps up the initial speed of a connection to faster than what it will sustain. For example, a 20Mbps-rated Internet connection may jump up to 40 or 50Mbps, but only for a few seconds. It occurs on a per-transfer basis, and most Internet activity, especially Web browsing, sees a boost from it. It doesn’t last long, though, and therefore doesn’t impact long downloads or streaming much. Speedtest.net uses a blend of boosted and unboosted data to determine overall speed. For the most part, PowerBoost isn’t a factor for speeds over 30 to 50 Mbps.

Vietnam's Tech Boom

A look inside Southeast Asia's Silicon Valley.

BY ROB MARVIN

More than four decades after choppers lifted the last U.S. troops back across the world, Vietnam's Da Nang Hi-Tech Park hums with activity. The park, one of several established as part of Vietnam's 2020 IT Master Plan, houses offices and factories for a growing number of international IT and software companies, hardware manufacturers, and infrastructure plants powering the central Vietnamese city at the heart of a tech boom.

Today's Vietnam—with a population of over 93.5 million and a median age of 30.3 years old—is defined by a growing population of young coders, engineers, entrepreneurs, and students driving economic growth and technological innovation. For them, the country's war-torn past is a history lesson, not a memory.

Vietnam barely had any IT companies 15 years ago, but now there are close to 14,000 IT businesses spanning hardware, software, and digital content. The Vietnamese government sees the tech sector as the linchpin of the country's economic growth, according to Long Lam, CEO of QuangTrung Software City (QTSC), Vietnam's largest software park. It has heavily invested in infrastructure and passed economic policies encouraging both domestic and international entrepreneurs to start businesses.

From Vietnam's northern capital of Hanoi to the coastal city of Da Nang to Ho Chi Minh City (HCMC, formerly Saigon) in the south, regional universities churn out hundreds of well-trained IT and software engineering graduates each year. Many are recruited right out of school by companies like Cisco, Fujitsu, HP, IBM, Intel, LG, Samsung, Sony, and Toshiba. More and more graduates also choose to seek venture capital (VC) funding to launch startups.

Hung Q. Nguyen, CEO, president, and cofounder of software testing company LogiGear, said these young IT professionals represent the first generation of Vietnam's middle class. "Young people in Vietnam are hungry," said Nguyen. "The market there is really hot, and this generation now has enough money to buy a home and get an apartment. It's quite a tremendous change in the country."

Nguyen grew up in Vietnam but left to attend school in the U.S. He settled in Silicon Valley, later cofounding LogiGear in 1994. In the mid 2000s, when looking to outsource internationally, Nguyen chose to go home. LogiGear opened research and design facilities in HCMC and, over the next decade, expanded to more than 500 employees there, moving a large chunk of its operations to a new Da Nang facility in 2014.

Along with many other Western-educated expats returning to Vietnam, Nguyen has become an ambassador of sorts of the country's business potential.

Vietnam barely had any IT companies 15 years ago, but now there are close to 14,000 IT businesses.

AT THE TOP
Long Lam is the CEO of QuangTrung Software City, the largest software park in Vietnam.

Challenging the traditional view of Vietnam's sole use as a cost-effective outsourcing location, LogiGear was one of the first companies to launch employee training programs, guest lecture at universities, and collaborate with other companies to form The Vietnam IT Outsourcing Organization (VNITO), a community aiming to collectively shape the perception of Vietnam as a thriving hub for the entire spectrum of IT.

In Vietnam, IT is a blanket term encompassing any products and services related to computing and Internet technology, including software, hardware, enterprise, networking, and telecommunications.

In Da Nang in particular, Nguyen saw modern infrastructure and a wealth of capable engineers waiting for an opportunity. "Nothing is like Silicon Valley, with its elements on innovation, first-movers, and world-changing technology," said Nguyen. "But this country is very vibrant, very forward-looking. The workforce itself doesn't yet know quite what it's like to do business the way the West does but, from the perspective of a tech hub, Vietnam has a lot of potential."

DA NANG: THE CENTRAL METROPOLIS

Da Nang is Vietnam's fourth-largest city, a tourist location known more for its beach resorts and fire-breathing Dragon Bridge than its tech sector. Yet, after heavy government investments in a new $60 million airport and a $93 million highway system (according to Bloomberg), the city's infrastructure is far more suited for large-scale economic growth than the older, more crowded Hanoi and HCMC.

IBM agreed. In 2012, the company selected Da Nang as one of 33 cities worldwide to receive IBM's Smarter Cities Challenge grant, a $50 million, three-year program to revamp the city's infrastructure around economic development, sustainability, transportation, and urban planning. IBM's Da Nang initiatives, deployed in 2013, focus on optimizing water quality and

DA NANG
Top: The LogiGear offices in Da Nang. Bottom: A view of Da Nang at night.

public transportation through real-time, Big Data processing and predictive analytics. “Da Nang is emerging as a fast-growing and well-planned city, which I think put them in a perfect position to experience new economic development initiatives,” said Tan Jee Toon, general manager of IBM Vietnam.

IBM has had offices in Hanoi and HCMC since 1994 and opened its Da Nang office in 2012. The company is entrenched in Vietnam’s banking and finance industries, of which Toon said 60 percent are customers. IBM has also led a governmental and private sector push toward cloud computing in the country. Toon said Da Nang is the Vietnamese city best suited for international IT expansion, whereas the atmosphere in Hanoi around government and state-owned enterprises is more conservative. HCMC, he said, is more commercially driven and dominated by small and mid-sized enterprises (SMBs).

Despite the company’s optimism toward Da Nang, IBM’s Smarter Cities initiative has faced bureaucratic hurdles. For example, though IBM’s Intelligent Operations Center and its Intelligent Water Solution were deployed in 2013, the projects are still in their initial phase. The largest obstacle, Toon said, is funding. The city’s government is seeking further loans and public-private partnership investments to realize the vision of the initial Smarter Cities blueprint and complete the shift toward becoming an environmentally and economically sustainable city, according to Toon.

Beyond its infrastructure initiatives, IBM has hedged its bets in Da Nang and in Vietnam’s future by tapping into the country’s educational pipeline. Along with LogiGear and dozens of other companies operating in Da Nang, Hanoi, or HCMC, IBM offers career training and internship programs as part of its partnerships with IT universities.

Vietnam’s university system parallels its cities. The three largest IT universities in the country are the Da Nang University of Science and Technology, the Hanoi University of Science and Technology, and the Ho Chi

Minh City University of Science and Technology. Each regional school graduates engineers that are recruited directly into the local workforce. “We provide the most engineers in IT for Central Vietnam,” said Dr. Binh Nguyen, director of the IT department at Da Nang University of Science and Technology. “Last year we graduated 250 students and we now have 30 PhD students. Most students choose software engineering. All students do internships at companies for between two and five months, and last year 50 percent of the interns were recruited.”

As Dr. Nguyen explained, the entire curriculum and university experience are geared toward developing directly applicable workforce skills in students through programming courses, lectures on emerging technologies, and communication and language classes in English and Japanese. Each year, the university invites approximately ten companies for a week of lectures, interviewing, and recruiting.

Vietnam’s universities are competitive. The Da Nang University of Science and Technology’s IT Department admits only 250 students a year (out of more than 2,000 applicants), chosen based upon the results of a national standardized competition. Dr. Nguyen said most of his students come from poor, hardworking, central Vietnamese families. “IT workers are an in-demand resource,” said Dr. Nguyen. “Some of my students work for big companies. Some created small companies of around ten or 20 employees. We are also developing a new incubator program next year for students in IT. We want them to develop the right skills. The problem in Vietnam is everyone wants to go to university.”

But once the newly graduated engineers are out in the working world, starting their own companies is surprisingly easy, as new businesses in Vietnam are exempt from taxes for the first eight years. Vietnam is also now a member of the World Trade Organization

SILICON VIETNAM
Top: Dr. Binh Nguyen, director of the IT department at Da Nang University of Science and Technology. Bottom: The LG offices in Ho Chi Minh City.

(WTO), protecting the intellectual property (IP) rights of its companies. Last year, Dr. Nguyen invited Finnish entrepreneurs to lecture his students on launching startups.

Dr. Nguyen is another expat and was one of Da Nang University's first IT department graduates back in 1997. After earning his PhD in France, he returned to teach and ultimately became the dean. "I came back because my family lives here," he said. "I find that Da Nang is a beautiful city. Da Nang is a new city. Capital of the center. It's less crowded and polluted than Hanoi and HCMC, and there are beautiful beaches. Most importantly, people can find jobs."

HCMC: THE SOUTHERN TECH HUB

As fast as Da Nang's tech sector is growing, Vietnam's more vibrant startup atmosphere is located 850 kilometers south in HCMC. The culture and community began taking shape in 2010 at hackathons and start-up boot camps organized, in part, by Dr. Vu Duong, the first director of the John Von Neumann (JVN) Institute located within Vietnam National University, HCMC.

Duong's self-described mission is to build Vietnam's next generation of entrepreneurs and technologists. Duong, who holds a Master's degree in engineering and a PhD in artificial intelligence from France's École Nationale des Ponts et Chaussees, runs the JVN Institute's entrepreneurship program. In a building where the walls are used as blackboards for brainstorming sessions and where an academic environment centered around freedom of ideas is encouraged, Duong teaches a small group of postgraduate students each year about how to think up and create innovative technologies—and then build successful businesses around them.

Duong envisions the eager and capable younger generation as an example of Vietnam's startup potential to a business sector that is largely still conservative.

Duong's self-described mission is to build Vietnam's next generation of entrepreneurs and technologists.

LEADER OF THE PACK
Vu Duong, of Vietnam National University in Ho Chi Minh City, is teaching his students how to think creatively and build businesses wisely.

“The tech community in Vietnam is developing a startup culture, and that’s the truth,” said Duong. “Today, the number of hackathon and startup boot camps amounts to quite a few every month in the large cities of Vietnam. However, the Silicon Valley–like mentally is not yet there. They still prefer to not take too many risks. Only those who have been introduced to innovation and entrepreneurship are likely more adventurous to lead startups.”

Guest lectures at the JVN Institute include an entrepreneur boot camp taught by Tom Kosnick, Stanford University’s Fenwick and West Consulting Professor, and ex-Googler Thuc Vu, who will oversee a new master’s program in innovation, leadership, and entrepreneurship next year.

JVN Institute’s entrepreneurship graduates launch two or three new startups a year according to Duong. For example, language flash card company BlueUp VN was founded in 2011 and received funding from a major Vietnamese tech investor. Inbound Marketing Partners was founded in 2013 by two JVN students and provides online marketing and content automation services. Sentifi, cofounded by Duong’s assistant, applies data analytics to finance. Others are developing Web services, games, and apps focused on e-commerce, social media, and more.

For the moment, HCMC’s startup culture is concentrated on the local market and apps that appeal to Vietnamese users to better their quality of life. Vietnam’s young app developers and entrepreneurs are motivated by the desire to help their country realize its cultural, economic, and technological potential—the same reason Duong, Dr. Nguyen, and LogiGear’s Nguyen returned home in the first place.

“Vietnam is quickly becoming an investment and tech hub for local and international enterprises, and HCMC is at the heart of this transformation,” said Jeff Diana, chief people officer at enterprise software company Atlassian. “The industry is still fairly nascent here, but we are starting to see the market mature from either packaging software or outsourcing to a product

environment. This is leading to an increase in startups focused on e-commerce and product development."

Atlassian expanded research and development operations for its communication and collaboration software into Vietnam in 2013, which Diana said was motivated by the country's modified educational structure that is producing capable and talented coders. Atlassian's development center in HCMC began with a team focused on building features for Confluence, the company's team content collaboration platform. But, in the last two years, it has launched new teams that are focusing on Jira Service Desk and Atlassian's flagship Jira issue management software.

VNITO is the Vietnam tech industry's chance to show itself off to the world.

The company invested in a recruiting campaign called "Gradlassian HackHouse" aimed at local universities, plus a two-week boot camp and developer training for all new hires. Atlassian's Vietnam Careers page alone shows open positions spanning Android/iOS development, UI/UX design, .NET, Java, front-end development, product management, and more—to be filled almost entirely by local professionals, according to Diana.

Vietnam's booming tech sector and economic growth over the past five years is set to culminate this October at VNITO, the country's inaugural Vietnam IT Conference. Organized by QuangTrung Software City and the Ho Chi Minh City Computer Association, VNITO is the Vietnam tech industry's chance to show itself off to the world.

For four days starting October 14, more than 150 multinational tech companies, more than 200 Vietnamese IT and outsourcing companies, and 20 universities are expected to descend upon the Reverie Saigon hotel in HCMC. Keynotes will include speakers from Gartner, KPMG, HP, LogiGear, Microsoft, and Samsung, as well as several ministers of the Vietnamese government. "I believe that, through VNITO, friends and international partners have the evidence to recognize Vietnam as an attractive, emerging destination for IT companies worldwide," said QuangTrung's Long, also the main organizer of VNITO.

VNITO's figures project the education system graduates 40,000 new graduates a year into the IT workforce and budding enterprise ecosystem. Long predicts that 2015 "is the year the startup wave in Vietnam begins to rise."

Ridley Scott Meets *The Martian*

The acclaimed director tackles real-life science in filming the story of how astronaut trapped on the Red Planet. BY SOPHIA STUART

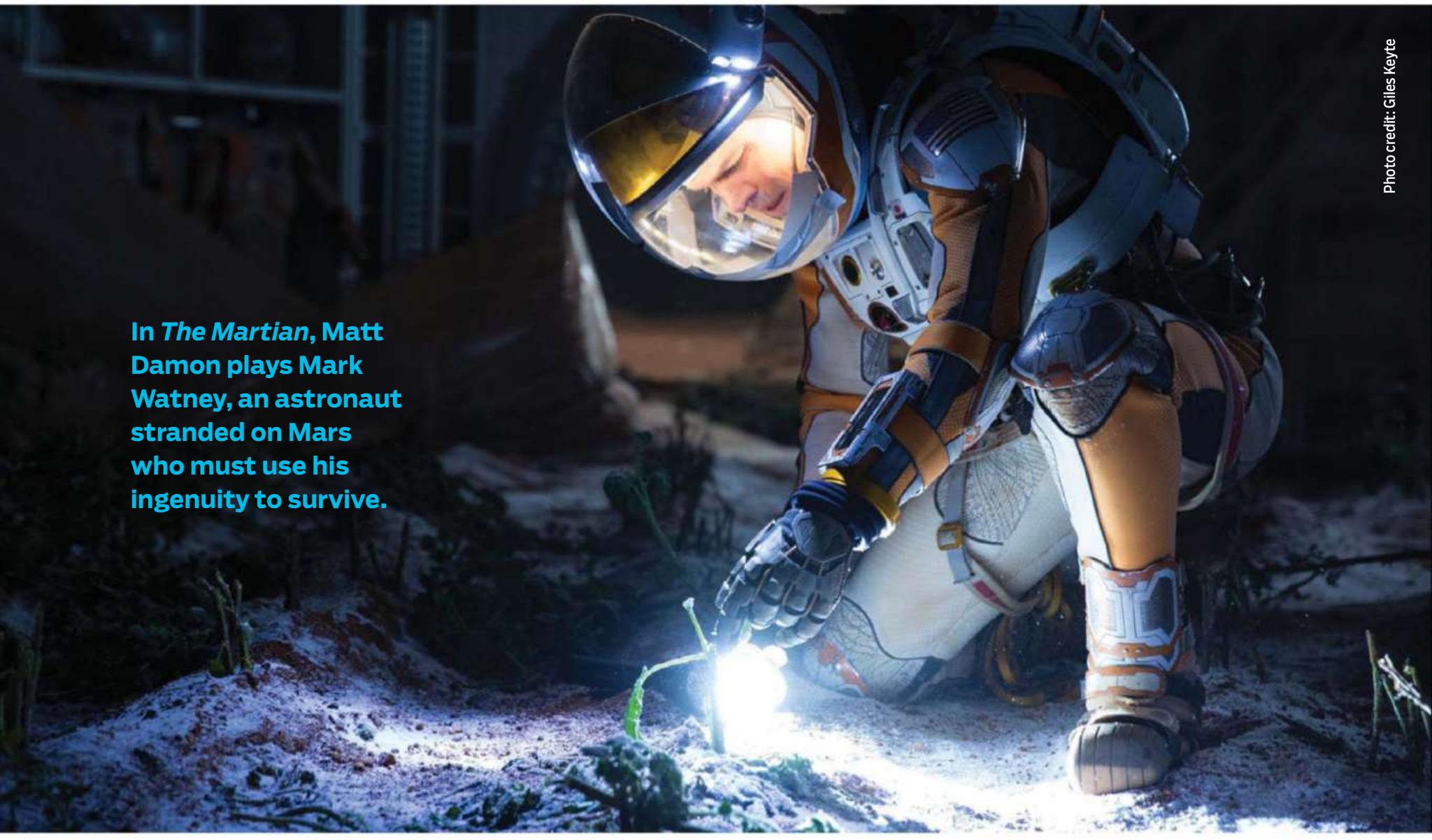


Photo credit: Giles Keyte

In *The Martian*, Matt Damon plays Mark Watney, an astronaut stranded on Mars who must use his ingenuity to survive.

The Martian is both a post-disaster-scenario thriller and an homage to the international brotherhood of scientists, who look beyond rivalries and borders to forge interplanetary futures. *PC Magazine* went to the Toronto Film Festival for the gala premiere of the movie (which opens in the U.S. on October 2) and interviewed director Ridley Scott to find out more.

Based on Andy Weir's best-selling 2011 novel, and with a screenplay written by Drew Goddard (*World War Z*), *The Martian* features a starry cast led by Matt Damon as the brilliant, wisecracking botanist Mark Watney. Watney is left for dead on the Red Planet after a devastating storm forces his fellow crew

members aboard the Hermes spacecraft to evacuate and abandon the third Mars mission, Ares III. Damon is ably supported by Jessica Chastain as Commander Lewis with Kristen Wiig, Jeff Daniels, Sean Bean, and Chiwetel Ejiofor playing staff back at NASA headquarters in Washington, D.C., and the Jet Propulsion Laboratory in Pasadena, California.

Of course, this is not Scott's first science fiction film. He is well known for the classics *Alien* and *Blade Runner*. His career has also been recognized by Academy Award nominations for Best Director on *Black Hawk Down*, *Gladiator*, and *Thelma & Louise*.

"*The Martian* is the ultimate survival story," Scott told *PC Magazine*. "Mark Watney is placed under unimaginable duress and isolation, and the movie is about how he responds. Mark's fate will be determined by whether he succumbs to panic and despair and accepts death as inevitable—or chooses to rely on his training, resourcefulness and sense of humor to stay calm and solve problems."

Damon dominates the film in a superb performance. He's a thoroughly engaging antihero as he nixes existential despair and instead learns to grow crops—on a planet where nothing grows—with some innovative techniques for fertilization.

The Martian is set in the near future, and, according to the filmmakers, virtually every scientific detail is plausible and supported by current theory. Apart
from, that is, the major plot point of the severe windstorm that forces the crew of the Hermes back onto their ship. Due to Mars' low atmospheric pressure (less than one percent of Earth's), a windstorm of that severity is not possible. But without the windstorm, you don't have a movie.

So how did Scott prepare Damon for the bleak prospect of slowly wasting away from starvation on a deserted planet?

Photo credits: NASA/Bill Ingalls (middle), Eric Charbonneau/Invision for Twentieth Century Fox/AP Images (bottom)

> NASA cooperated fully, which helped to ground the movie in reality.

Photo credits: Courtesy of Twentieth Century Fox (top), Aidan Monaghan (bottom)

"'The cat's dying?' 'Your mum's got cancer?' No, no, no. I never do any of that," laughed Scott, with a voice that has a congenial gravelly gravitas. "I don't do elongated rehearsals, or backstory—you can kill things by doing that. The most I do is gather around a table with a cup of coffee and talk. I cast very well, I take a long time doing it. Then I see them getting made up in the dressing room on the first day, walk in, say 'All right? How you doing? Out there in 45 mins, okay?' I do a walkthrough just for focus, then say, 'Okay, we're going to roll.' I always roll camera from first rehearsal. Invariably I get what I need in the first few takes. That's how I can do 60 setups a day on a total shooting schedule of just 74 days. It was really quick."

NASA cooperated fully, which helped to ground the movie in reality and speed up the process. Apparently Dr. Jim Green, director of the Planetary Science Division, cleared his diary when he got the call from Scott.

"Yes, he did," laughs Scott. "They're all science fiction buffs, you know. One NASA guy said to me, 'We get a lot of ideas from you guys. Because you think dramatically, but we're not allowed to, we're


Photo courtesy of Twentieth Century Fox

scientists, but somewhere in your drama I find a good idea to unlock an equation I'm struggling with."

As part of the research process at NASA, Scott wanted to make sure that his representation of the global science community rang true.

"Would China be as helpful as we show in the film? We had it in the script as a price initially, but we removed it, because one scientific brotherhood would help another. The Chinese bought it—they thought it was noble. Scientists are enjoined with each other."

It wasn't just the People's Republic of China that got a preview, for the record. Elon Musk did too. Did Scott meet him in Musk's capacity running supply missions for NASA?

"No, I've never met him," said Scott. "But he's seen the film. He's a genius. He's been doing some designs for NASA and so the [Mars Ascent Vehicle] at the end which takes off is very much from his kind of design. It's reusable. It isn't a one-shot thing where you chuck away half a billion dollars after a launch."

On a side note, Scott is also tempted by Musk's Tesla range.

"I used to be a car man, but now I drive a Prius. In fact I've got two. People say, 'What are you doing? Are you economizing?' And I reply, 'No, I'm saving the world.' But I'm starting to get tempted with Elon Musk's electric car."

What's next on the agenda for Scott?

"A western. A western is long overdue. I was brought up on Gene Autry and Roy Rogers. Used to go up to my aunt's place in Scotland and ride horses in Lockerbie. I was a good rider. When you're a kid, you're nuts, you're fearless. I

MARS STARS
Ridley Scott and Matt Damon, pictured at the 2015 Toronto International Film Festival.

Photo credit: Eric Charbonneau

thought maybe I could be a jockey. So yes, a Western."

Finally, it would be foolish to be in Scott's presence without mentioning *Blade Runner*.

Suddenly, Scott gave *PC Magazine* an exclusive (at least as far as we can tell). The title sequence to Blade Runner reads "Los Angeles, November 2019," but according to Scott, he wanted it to spell out something else entirely different.

"I was going to put 'San Angeles.' But the partners at the time said, 'Duh? What do you mean, San Angeles?' 'It means when the suburbs of San Francisco join with Los Angeles.' 'Do you really think that's going to happen?' And I said, 'Are you kidding me? It's already happening!' But they thought that was too negative. So they went with 'Los Angeles, November 2019' instead."

It's already 2015, and we're not (that) close to the replicants of the Nexus 6 release causing havoc in downtown Los Angeles or even San Angeles (we hope). But in *The Martian*'s not-so-distant-future (circa 2025), NASA's Mars 2020 mission will already be a reality. That means sci-fi and reality are melding together faster than anyone expected.

What We Love Most This Month

BY STEPHANIE MLOT

AERELIGHT A1

OLED (organic light-emitting diode) technology is usually associated with high-definition, high-priced television sets. Now it is affiliated with desk lamps, thanks to the aerelight A1. The sleek device boasts an ultra-thin OLED light panel radiating naturally soft light from a touch-controlled aluminum frame, atop a wood base that serves as a wireless charger for compatible devices. The aerelight A1 comes in black, red, and silver.

$299 aerelight.com

What We Love Most This Month

BY STEPHANIE MLOT

CUBESENSORS

You needn't look past your smartphone, tablet, or wearable to learn more about your personal health and nutrition needs. But what about the health and productivity of your home or office? Place a CubeSensors Cube in your kitchen, nursery, cubicle, or family room to identify what's keeping you awake at night, measure air pollutants, and help avoid overheating or overcooling throughout the year. The Cubes also let you monitor their surroundings while you're away.

$299 (two cubes), $449 (four cubes), $599 (six cubes) cubesensors.com

What We Love Most This Month

BY STEPHANIE MLOT

RETRO ALARM CLOCK RADIO

What time is it? Time to get a new Retro Alarm Clock Radio. Available from Electrohome, the upgraded bedside staple boasts motion-activated night-light and snooze, gradual wake-up lighting, and dual alarms with weekend cancellation. Forget those preset buzzers and bell rings; instead, fall asleep and wake up to your favorite digital AM or FM radio stations—up to 20 of which can be saved directly to the device. Plus, battery backup means never being late to work, even during a power outage.

$34.99 electrohome.com

What We Love Most This Month

BY STEPHANIE MLOT

SATECHI BLUETOOTH CORTANA BUTTON

Can't reach your Windows Phone while driving? Left your Surface tablet at the other end of the house? Just tap the Satechi Bluetooth Cortana Button to access your smartphone or slate, even when it's out of reach. The button attaches to a keychain, steering wheel, dashboard, or any number of other creative spots for a one-touch connection. And you don't even have to shout "Hey, Cortana" at your devices.

$22.99 satechi.net

What We Love Most This Month

BY STEPHANIE MLOT

WORX LANDROID M

Instead of paying the neighbors' kids to mow your lawn, splurge for the Landroid M cordless robotic lawn mower. Grab a cold drink and a good book, then relax as the 7-inch, 28-volt robot gets those hard-to-reach spots. Equipped with an artificial intelligence algorithm for making difficult cuts and an antitheft security PIN, the user-friendly Landroid detects low battery power and can automatically return to its charging station. Environmentalists can have their cake and eat it too, as the Landroid provides zero emissions and low noise levels.

$999.96 worx.com

Opinions

WILL GREENWALD

TIM BAJARIN

DOUG NEWCOMB

The new Apple TV doesn't reinvent TV. It updates Apple TV to have a fighting chance.

WILL GREENWALD
THE NEW APPLE TV IS LATE TO THE PARTY

The New Apple TV Is Late to the Party

Will Greenwald, a *PC Magazine* consumer electronics analyst, has also written for CNET, GamePro, Geek.com, *Sound & Vision*, *Maximum PC*, and other publications.

After three years, Apple has finally refreshed the Apple TV with features never before seen on the device. As Apple describes it, the company is reinventing TV to fit how our viewing habits have changed. Not exactly.

Disclaimer: I expect the new Apple TV will be a very good media streamer. Its previous iterations have consistently received strong reviews, and Apple almost always makes extremely polished and attractive hardware and interfaces. The Apple TV could easily get high marks. That's not the problem.

The problem is that Apple has finally crossed the finish line after everyone else showered and went home, but is once again pretending it came in first. The new Apple TV doesn't reinvent TV. It updates Apple TV to have a fighting chance against nearly every other media hub and most high-end connected HDTVs on the market. It isn't revolutionizing anything. It's playing catch-up.

Apple TV now has an app store. But Android-based media hubs have had them since their inception. Cupertino joins Amazon Fire TV's app store and the Roku Channel Store in offering some measure of selection beyond a tiny list of online services. Most connected HDTV platforms have also had their own app stores for a while. So it's been a long time

coming for Apple. It's not just an impressive addition but an obvious and necessary step to keep the Apple TV viable.

Apple TV now has games. Again, Android services did it first. If you really want power, the Nvidia Shield Android TV is much more impressive. It can stream games from compatible PCs, and has a beefier selection of "hardcore" games. The Sony PlayStation TV is an even better microconsole for games, though the barely changed PlayStation Vita interface means its actual media features leave a lot to be desired. It can natively play Vita, PlayStation Portable, PlayStation Now, and PSOne Classic games, and it can stream PlayStation 4 games from a system on the same network. And, at about $40, it's less than half the price of the Apple TV.

Beyond gaming-focused devices, Apple TV's games still aren't new. Android TV and Fire TV devices can all play plenty of games. Even Roku hubs can play some, and the high-end Roku devices have had motion control support for the last few generations for Angry Birds and other popular mobile titles available through the Roku Channel Store.

Of course, these devices have received little attention because if you want to seriously game, you're going to get a dedicated game console or a PC. And if you want to casually game, you're going to use the smartphone already in your pocket or the tablet in your bag. No one wants to stop watching Netflix to play Candy Crush on an HDTV.

Apple TV now has voice search with Siri. Again, Android did it first. Android TV and Fire TV devices have voice search with basic information engine support, and many come

with microphone-equipped remotes so you can just press a button and talk into your hand to search for movies or check the weather. Even Roku added voice search before the Apple TV with the most recent Roku 3.

Siri might add some subtle new functionality, like smarter search that lets you string together requests to narrow down selections, and I look forward to testing it. But I've seen just as impressive voice search demonstrations every time a product like this has been announced, and it always seems to lose a few dozen IQ points by the time it gets to our labs. Siri could surprise me on the Apple TV, but we'll have to see.

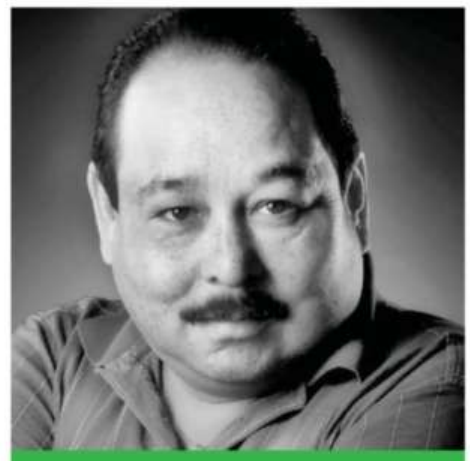
The new Apple TV will probably be a very good media hub, but the new features only now put it on the same level as devices like the Amazon Fire TV, Roku 3, and Nvidia Shield TV. And the Fire TV and Roku 3 are two-thirds the price of the new Apple TV (the Nvidia Shield TV is significantly more expensive, but it's also the only 4K-capable media hub of the group).

Apple's pretentiousness has a place when the company is showing off something genuinely new, or putting a fresh and appealing take on technology that already existed but didn't catch on. Apple deserved its accolades for the iMac, iPod, iPhone, and iPad. But with the Apple TV it's simply catching up to a product category that's already extremely well established and widely adopted. The Netflix revolution happened years ago, and nearly everyone now has some sort of device connected to their HDTV, if not their HDTV itself, with apps and plenty of online services. The usual Apple flair for self-aggrandizement just doesn't belong here.

“Apple deserved its accolades for the iMac, iPod, iPhone, and iPad. But with the Apple TV, it's simply catching up to a product category that's already extremely well established and widely adopted.”

will_greenwald@pcmag.com

Can Android Save the PC Industry?



Tim Bajarin is the president of Creative Strategies and a consultant, analyst, and futurist covering personal computers and consumer technology.

A few months back, I wrote a piece for Techpinions that asked if Android was the new Windows. I pointed out that when the PC was the center of our universe, Windows was the one constant. Today, the operating system universe is quite different, and there are at least two other operating systems, iOS and Android, that have divided the attention of OEMs and app developers. In terms of sheer numbers, Android has become the dominant device OS for tech products around the world.

For the PC industry, the rise of mobile, especially smartphones, has really put a damper on sales. But there is an interesting trend within the Android community that in a strange way could actually be important for the PC industry.

One of the things we know from our research is that for more than 1.5 billion people, their first introduction to personal computing was through a smartphone. These are low-power beginner devices, but we know that many of these people will eventually upgrade to a better smartphone or something with a bigger screen and even more functionality.

That larger device will most likely be a laptop, not a tablet. We know from research that many of these people are highly familiar with laptops and, in a lot of cases, want a laptop to help educate their kids, better manage images and

media, and perhaps even help run a family business.

But for me, the big rub with this idea is that buyers will want a Windows-based PC even if they have only ever known the Android OS. What makes more sense is to create a version of Android that can be used on a laptop.

Yes, this has been tried before with the Motorola Atrix, but the timing was wrong. Now, at least one solid Android-based PC is ready to go. Jide was founded by three former members of Google's Android team who left the search giant to create a rich version of Android that could run on a PC. In fact, the company is already selling a two-in-one Android portable for $400.

The Jide OS is called Remix, it runs Android apps, and it includes the Google Play store, which suggests that Google has blessed this version. It runs PowerPoint and other Office apps, as well as native Android apps. Our sources tell us that BlackBerry is also doing a dedicated Android OS that is highly secure, and there is at least one other major company in the software space doing something similar.

These are interesting developments and could have a big impact on PC makers. Today, their OS loyalty is still with Microsoft, although they have broken ranks to support Chromebooks, too. But for first-time smartphone users who will eventually graduate to a laptop, an Android-based device might be more familiar. If so, these PC makers would support Android on a PC in a heartbeat, which could be an interesting impetus to grow demand for laptops and PCs.

Drivers Don't Care About Car Tech

Thanks to Internet connectivity, cars are becoming more like computers, smartphones, and tablets. But as with consumer electronics devices, most people who own a car don't use and probably aren't aware of all the tech features they have in their vehicles.

That's what J.D. Power and Associates found in a new report that surveyed 4,200 car buyers from April through June of this year about the tech features in their new vehicles. The report revealed that at least 20 percent of respondents "never used" more than half (16 out of 33) of the vehicle technology features mentioned in the survey.

More than half of those surveyed said they don't use their vehicle's voice texting and voice recognition systems, and 32 percent ignored in-dash apps such as Pandora and Yelp. The report noted that 38 percent didn't care about their car's ability to create a Wi-Fi hotspot in the cabin using built-in wireless broadband connectivity. And of those surveyed, 35 percent didn't use their car's automatic parking feature, 43 percent never called a "concierge service" to provide navigation directions or a restaurant reservation, and a third didn't depend on a heads-up display to project information onto a car's windshield.

This isn't much different from the average person using a PC or other electronic device. I know I don't use all of the features on my devices.

Car tech expert Doug Newcomb has written for *Popular Mechanics*, *Road & Track*, and other publications, and is the author of *Car Audio for Dummies*.

MILLIONS OF DOLLARS OF LOST VALUE

Of course, some of the tech features on cars are more expensive or come as extra-cost options, so it's not an apples-to-apples comparison to consumer electronics. According to J.D. Power, because the auto industry is expected to sell about 14 million vehicles in 2015, this means that at least 2.8 million consumers are paying for technology they're not using.

One of the top reasons respondents cited for not wanting a specific technology feature in their next vehicle, for example, was because it "came as part of a package on my current vehicle and I did not want it."

"In-vehicle connectivity technology that's not used results in millions of dollars of lost value for both consumers and the manufacturers," Kristin Kolodge, executive director of driver interaction research at J.D. Power, said in a statement.

As with consumer electronics, if a buyer doesn't use a feature from the beginning, they likely won't use it at all. "The first 30 days are critical," said Kolodge. "That first-time experience with the technology is the make-it-or-break-it stage."

Car dealers are partly to blame given that new car owners reported that if a feature wasn't pointed out or if a dealer didn't explain how it works, they'd probably never use it, the report found. But automakers also don't properly train dealership staff.

"Automakers need to explain the technology to dealership staff and train them on how to demonstrate it to owners," said Kolodge. "While dealers are expected to play a key role in explaining the technology to consumers, the onus should be on automakers to design the technology to be intuitive for consumers," she added.

LONG-TERM BENEFITS

It may not matter so much if drivers don't use these handy features, but others could help save lives. Research from the Insurance Institute for Highway Safety has already shown that active safety or "driver" assist systems can step in when humans make mistakes, like not slowing down when a car ahead has stopped or is drifting out of a lane. Features such as forward-collision warning and lane-keeping assistance significantly cut down on the number of car accidents.

That reinforces Kolodge's point about the importance of making car tech more intuitive. And that's where most feature-packed consumer electronics and in-car technology diverge—think about that flimsy owner's manual that comes with your iPhone. "In many cases, owners simply prefer to use their smartphone or tablet," Kolodge said, "because it meets their needs; they're familiar with the device and it's accurate. Automakers need to get it right the first time, or owners will simply use their own mobile device instead of the in-vehicle technology."

> **In many cases, owners simply prefer to use their smartphone or tablet.**

Reviews

CONSUMER ELECTRONICS

Motorola Moto X Pure Edition (Unlocked)

Samsung Galaxy Tab S2 8.0 (32GB)

HARDWARE

Acer Aspire Switch 10 E (SW3-013-11N8)

Google OnHub

Ultimaker 2 Extended

SOFTWARE & APPS

LibreOffice 5

Panda Free Antivirus

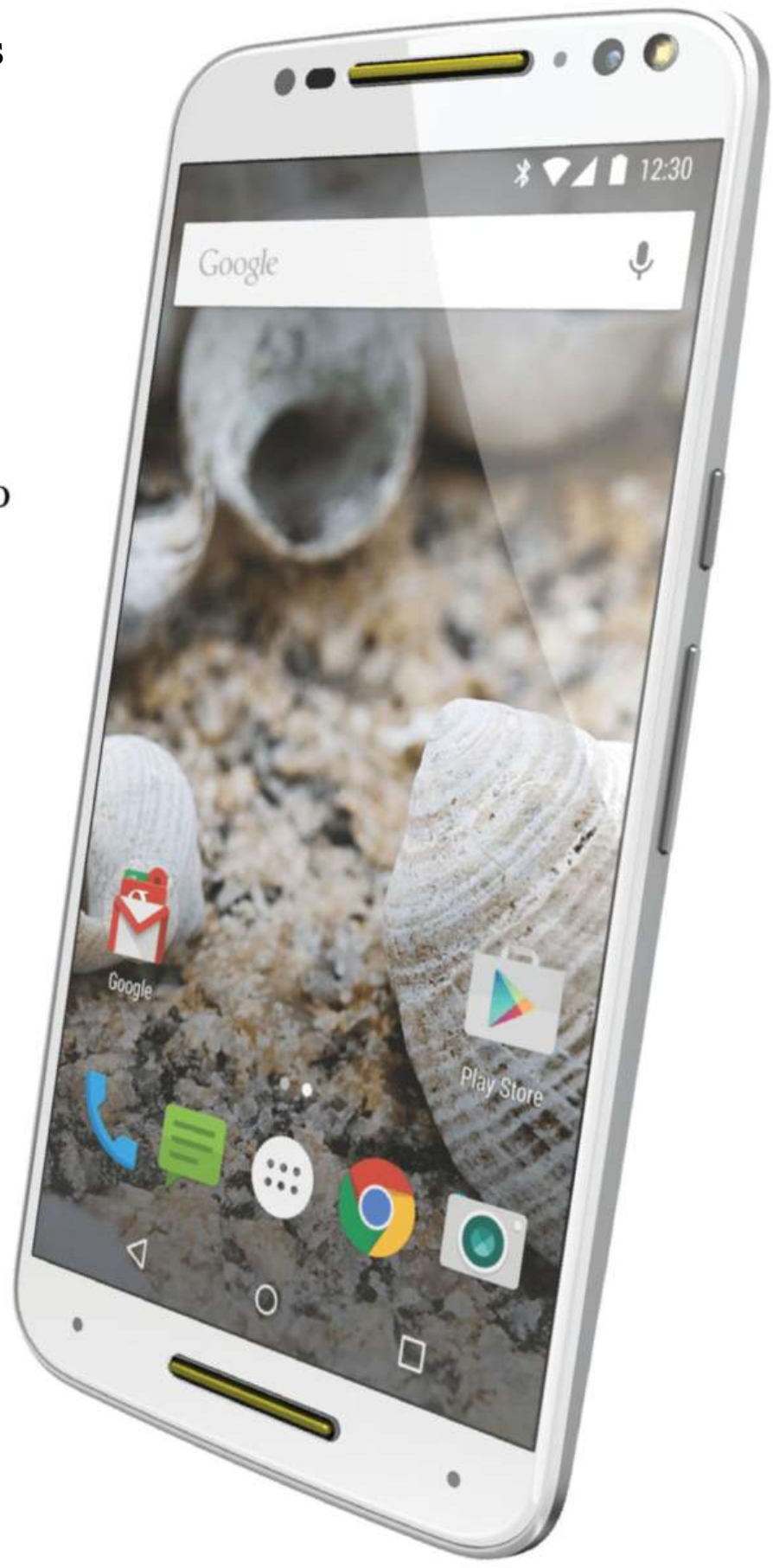
Check Point ZoneAlarm Free Firewall

A Top-Tier Unlocked Phone You Can Actually Buy

PC MAGAZINE EDITORS' CHOICE

When the first-generation Moto X came out two years ago, there weren't many other smartphones in the affordable unlocked flagship category. These days, the market is saturated with options: the Alcatel One Touch Idol 3 5.5, the Asus ZenFone 2, the ZTE Axon Pro, and the OnePlus 2, making the competition stiff for the new Motorola Moto X Pure Edition. Of these phones, the OnePlus 2 comes closest to the Moto X in terms of hardware, software, and camera, but it falls short in one key area: You can't go online and buy the OnePlus 2—but you can with the Moto X.

Motorola Moto X Pure Edition
(Unlocked)
$399.99



DESIGN AND DISPLAY

Motorola's Moto Maker, which lets you customize your Moto X, might be one of the best ideas any phone manufacturer has devised since the touch screen. You can select a number of different back colors, build materials, accent colors, frames, and engravings, and the Moto X Pure can be customized with a variety of silicone backs, along with wood and leather options for an additional cost.

With dimensions of 6.06 by 3.0 by 0.44 inches (HWD) and a weight of 6.31 ounces, the Moto X most certainly qualifies as a

phablet. Its size puts it on par with the Samsung Galaxy Note 5 and the Nexus 6. It's easier to use one-handed than either, however, because the Moto X's body has a gentle curve that conforms to your hand. The middle, where the Power and Volume buttons are, is slimmer than the top. The unit I tested has a silicone plastic back that's easy to grip while still being smooth to the touch.

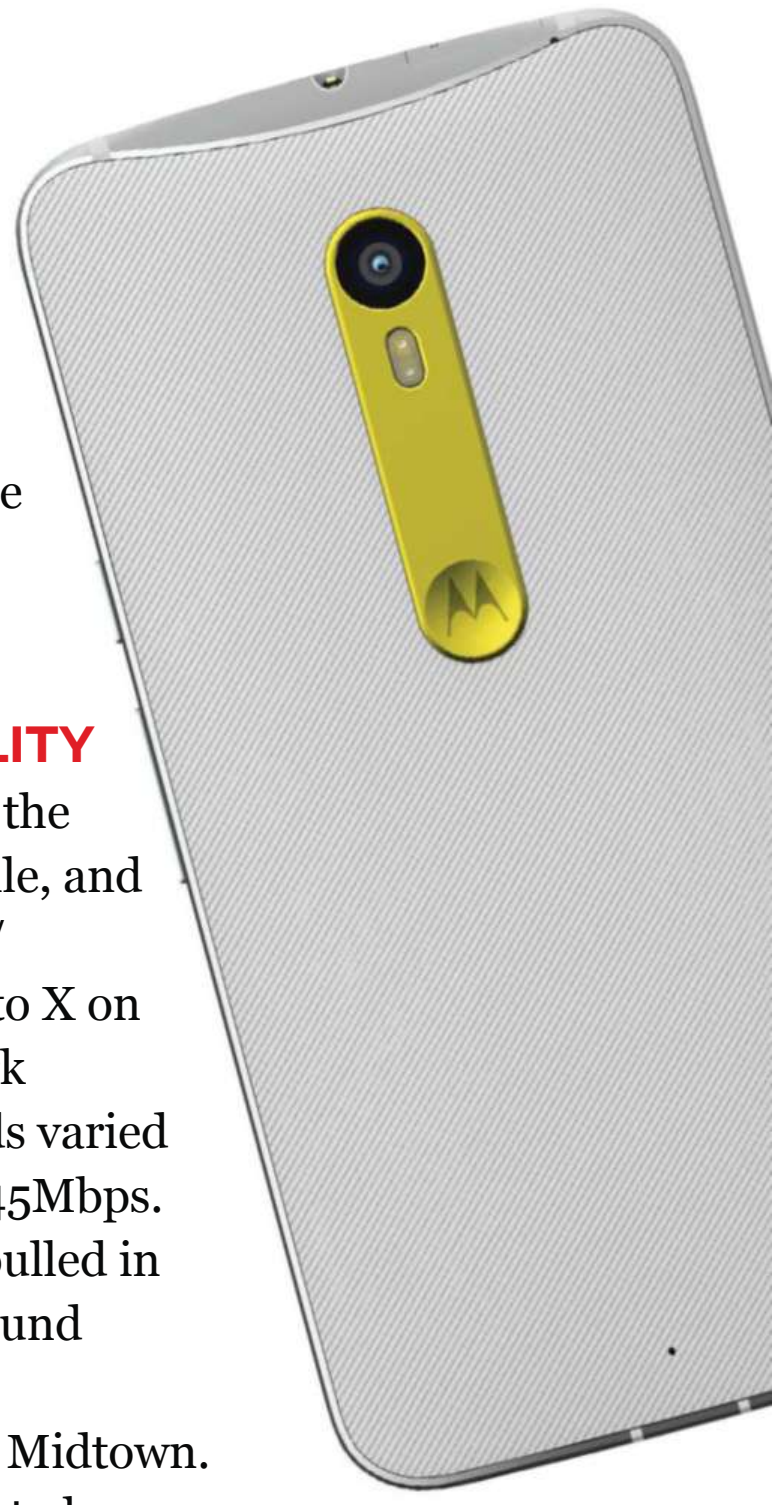
The front of the device has a 5.7-inch, 2,560-by-1,440 TFT LCD display, instead of the AMOLED display we saw on last year's Moto X. Some have argued that this switch defeats the battery-saving aspect of Moto Display, a feature that can show notifications without turning on the entire screen. An LCD display must use a backlight, but an AMOLED display can selectively light individual pixels to both save battery and show true black.

Otherwise, the display is fantastic, with a 520ppi pixel density. It looks extremely crisp, with good viewing angles and color reproduction. The colors aren't as bright or as rich as they are on the Galaxy S6's Super AMOLED display, but they are truer to life. The display is certainly better than the 1080p IPS LCD display of the OnePlus 2. And the screen-to-bezel ratio is just right, despite the dual front-facing speakers on the top and bottom.

Motorola Moto X Pure Edition
(Unlocked)

PROS Attractive customization options. Mostly stock Android with little bloatware. Fast charging. MicroSD slot. Excellent sound, call quality.

CONS Low-light camera performance needs work. Average battery life. Tends to run warm.



NETWORK PERFORMANCE AND CALL QUALITY

The Moto X comes unlocked and is compatible with the major U.S. carriers, including AT&T, Sprint, T-Mobile, and Verizon. It supports the GSM/GPRS/EDGE, UMTS/HSPA+, CDMA, and 4G LTE bands. I tested the Moto X on AT&T's network in Midtown Manhattan and network performance was excellent. Download/upload speeds varied from a low of 7.07/7.55Mbps to a high of 46.68/53.45Mbps. Connected to our Verizon FiOS 5GHz test router, I pulled in 134.80Mbps/89.34Mbps. There was no location I found myself without service.

Call quality on the Moto X was solid in all areas of Midtown. I made calls from several locations and found voices to have a

rich, natural tone. The earpiece gets loud enough to use in noisy environments, and the top-notch noise cancellation significantly dampened the sound of traffic, conversation, and even construction work. (Only at the highest volume levels it is possible to detect a faint crackling in the background.) Thanks to the dual front-facing stereo speakers, the speakerphone volume is also loud enough to hear outdoors without issue. The speakers also handled videos, music, and all other audio well, with robust sound and bass for a phone.

PROCESSOR AND BATTERY

The Moto X has a six-core Qualcomm Snapdragon 808 processor clocked at 1.8GHz with an Adreno 418 GPU and 3GB of RAM. That's nothing to scoff at, though it's not quite as powerful as the Snapdragon 810 and 4GB of RAM powering the OnePlus 2. The Moto X received an AnTuTu Benchmark score of 49,257, putting it on par with the LG G4, which also has a Snapdragon 808. The ZTE Axon Pro, with a 2GHz Snapdragon 810 processor and 4GB of RAM, received 49,289—showing that the Moto X has no trouble holding its own against heftier hardware.

Games like Asphalt 8 and Need for Speed: Most Wanted looked good on the Moto X, with no choppiness, skipped frames, or lag (provided you play one game at a time), though, as with the LG G4, Mortal Kombat X was unable to run beyond the intro video. Slowdowns occur when you have many apps open and try to switch between them, or, say, try to move from a game or the Google Now screen to another app. Even given this, the Moto X should be powerful enough to satisfy most users.

It's worth pointing out that the Moto X tends to run a bit warm. It doesn't suffer from overheating as we found with the LG G4, but the back averages

around 95° F during gaming and when charging. That's not enough to impact performance, but it's something to be mindful of.

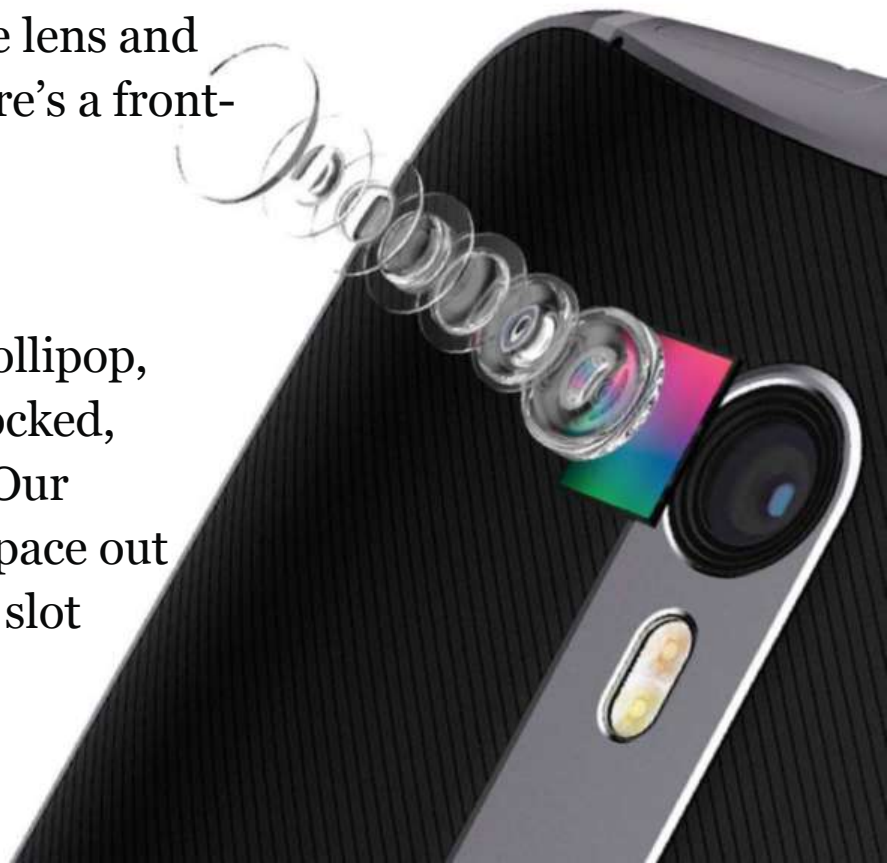
Battery life on the Moto X is only average. The device has a 3,000mAh battery, which seems small for a 5.7-inch phone with a high-res display. On our battery rundown test, the Moto X lasted 4 hours, 42 minutes. That's an average result, a bit less than the OnePlus 2 (5 hours, 19 minutes) and a lot less than the Galaxy S6 (6 hours, 33 minutes). On the plus side, Motorola's Turbo Charging technology lets you to add up to 10 hours of battery life (clearly not video streaming) in just 15 minutes.

CAMERA

The Moto X camera has seen some major improvements since last year's iteration. The 21-megapixel rear sensor has an f/2.0 lens and a revamped interface for the camera app. You can tap anywhere to capture a picture, which makes it easier to snap good photos when you're on the move. Burst mode, Auto HDR, and Phase Detect Auto-Focus also simplify things. You can take pictures very fast now, especially with Quick Capture—a twist of your wrist twice launches the camera app.

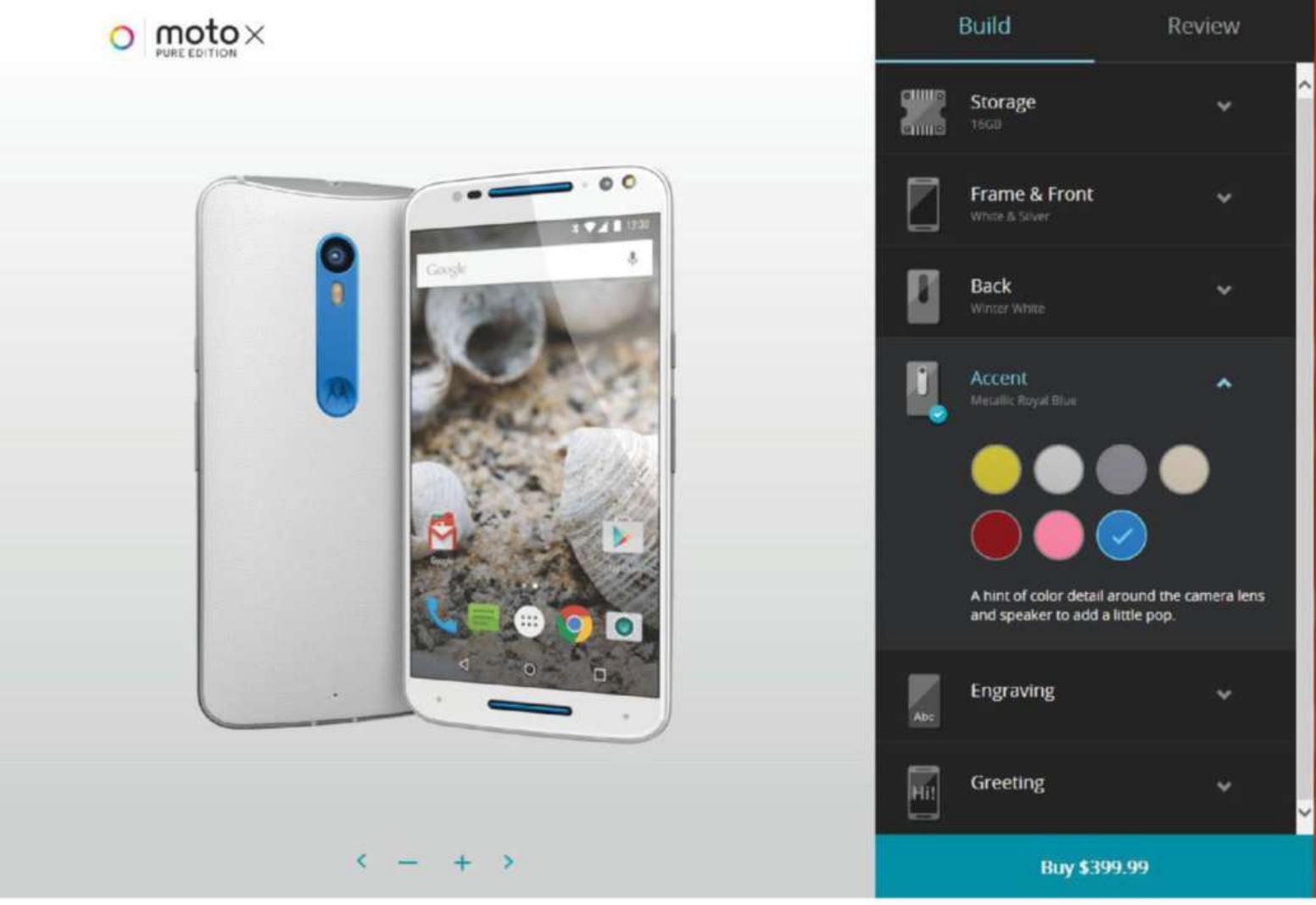
The pictures I took outside and indoors under decently lit conditions came out crisp and clear, with no noise or loss of detail, and outstanding color reproduction. The Moto X is capable of shooting 4K video at 30 frames per second (fps) and 1080p video at 60fps. In both cases, the video comes out clear, with good details, and the autofocus reorients itself quickly in response to movement. Unfortunately, the camera still lacks optical image stabilization and struggles in low-light settings. Pictures taken in less-than-ideal lighting conditions suffer from grain and noise.

The front-facing 5MP camera also does well in capturing natural skin tones and coloration for selfies. The wide-angle lens and f/2.0 aperture is good for group shots, and there's a front-facing LED flash.



SOFTWARE AND CONCLUSIONS

The Moto X runs almost-stock Android 5.1.1 Lollipop, with zero bloatware. Because the device is unlocked, there are no carrier apps cluttering things up. Our 32GB review unit came with 24.06GB of free space out of the box. The device also has a microSD card slot and is capable of taking cards up to 128GB.

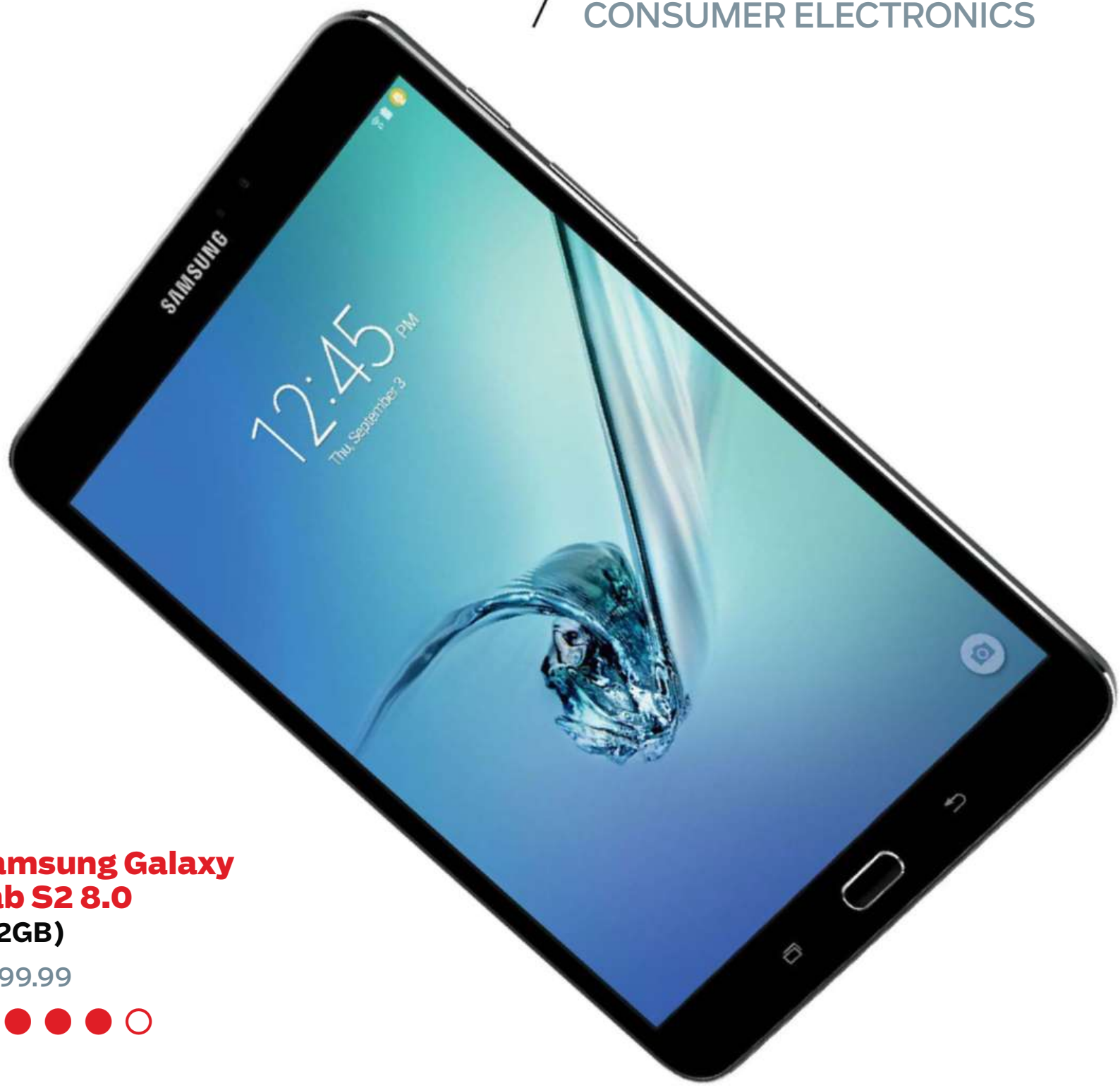


MOTO MAKER
The Moto Maker website lets you configure the Motorola Moto X Pure Edition to your exact specifications, regardless of what sort of back design, accent colors, and engraving options you may want.

All the Google apps like Chrome, Gmail, and Google Play Music come preloaded, as do Motorola apps like Moto Connect (for adding and managing other Motorola devices), Moto Migrate (for transferring data from your old device), and Moto Assist (for setting up features like Moto Display, which triggers the screen when you wave your hand above the phone). There's also support for Moto Actions, like using a chopping motion twice to activate the flashlight. Finally, Moto Voice lets you set up your own custom launch phrase and decide which tasks you want to perform with voice commands. For instance, you can ask, "Do I need an umbrella?", and the Moto X will give you the weather. All of these apps are gems, and remarkably reliable.

The Moto X and the OnePlus 2 have different strengths, with the Moto X boasting a sharper display, faster charging, expandable memory, better speakers, and Moto Maker design options, whereas the OnePlus 2 has a more powerful Snapdragon 810 processor, better battery life, a USB-C port, and a fingerprint scanner. Normally it would be difficult weighing the devices against one another, but the OnePlus 2 has one big flaw: It still retains the much-criticized invite-only purchase system that has caused release delays and actually prompted the company to issue an apology to customers. Considering all it does well and the fact that you can actually buy it, the Moto X Pure Edition is an easy pick for our new Editors' Choice for unlocked smartphones.

AJAY KUMAR



Samsung Galaxy Tab S2 8.0
(32GB)

$399.99

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Samsung's 8-Inch Galaxy Is a Tablet Worth Taking

PC MAGAZINE EDITORS' CHOICE

Despite releasing some very large phones recently (the Galaxy Note 5 and the Galaxy S6 edge+), Samsung still believes there's a home for tablets in a market crowded with enormous phablets. And Samsung's latest offering, the Galaxy Tab S2 8.0, definitely makes the case that, yes, tablets are still very much relevant. The 8-inch Tab S2 is thinner, lighter, and faster than last year's Galaxy Tab S 8.4, with a new eight-core processor and a luscious Super AMOLED screen, all in a body that's just slightly more than 0.2 inch thick.

DESIGN

If you've seen Samsung's latest smartphones, you'll recognize the new design approach the company is taking with the Galaxy Tab S2. Like the Galaxy S6 and the aforementioned Note 5 and S6 edge+, the Tab S2 has Samsung's new premium design language written all over it. Instead of the dimpled back of the original Tab S, there's now a smooth matte finish. The frame is metal, with curved edges and a glass front. The band around the tablet is more subtle than last year's iteration, a barely noticeable but bright silver. Measuring 7.8 by 5.3 by 0.22 inches (HWD) and weighing just 9.3 ounces, the Tab S2 is markedly thinner and lighter than either its predecessor (0.26 inch thick, 10.37 ounces) or Apple's iPad mini 3 (7.87 by 5.3 by 0.29 inches, 11.68 ounces). That helps justify the price of the 32GB tablet when compared with the iPad mini, which starts at $399 for the 16GB model. (The 9.7-inch version of the Tab S2, with 32GB of storage, costs $499.)

One of the things that the Tab S2 has in common with its older sibling is that Super AMOLED screen. The 2,048-by-1,536, 8-inch panel packs a density of 320ppi, and colors are vibrant and saturated. The screen looks crystal clear in pretty much all lighting situations. Audio from the dual speakers, which are located on the bottom of the Tab S2 with the micro USB port, was a bit hollow at louder volumes, but sounded rich and full over headphones.

On the right edge of the Tab S2 are Volume and Power buttons, along with a microSD slot that supports cards up to 128GB. The camera is square in the middle of the back panel, and there are small, circular, magnetic holders for one of Samsung's proprietary cases on the left side, as on last year's model.

Samsung Galaxy Tab S2 8.0 (32GB)

PROS Premium feel. Extremely thin, light. Sharp screen. Powerful processor. Solid camera.

CONS Many new features require additional Samsung devices. Some bloatware. Average battery life.

FEATURES

The Tab S2 has support for multi-window multitasking. Although that feature was available last year, it slowed the Tab S down significantly. But the Tab S2 is able to keep open up to six windows without a hitch, though three windows seems to be pushing it without the screen becoming a giant mess. Two, for me, is ideal—it rth between apps. Still, it's nice to have the option for nore.

This time around Samsung has added a fingerprint sensor. Unlocking the screen by touching my thu b to the Home button was almost instantaneous, on par with Apple's sensors.

Another new feature is SideSync, which lets you control your phone from your tablet via Wi-Fi, so if it's he couch with the Tab S2, you can take a call, drag and drop files, and even send text messages. I paired the tablet with a S6 edge+ and called one of my collea ues, and the feature worked as promised, with call quality that was quite good.

QuickConnect uses both Bluetooth and Wi-Fi to or mirror your phone screen, like a Chromecast. But it can also let you mirror what's on your TV to your tablet. It worked well enough on a Samsung HDTV in our lab, although image quality on the 65-inch television we used for testing was grainy.

Although these features help differentiate the tablet from the competition, they also require that you live in a very Samsung-centric ecosystem. For instance, you can't use SideSync with an iPhone or some other non-Samsung Android phone, and QuickConnect only works with Samsung's current lineup of smart TVs and a few others.

The Tab S2 comes with a 4,000mAh battery, which is not a very large source of power for an 8-inch screen. On our battery test, which streams a video at full

"The Tab S2 is able to keep open up to six windows without a hitch."

KEEPING TABS
The Samsung Galaxy Tab S2 8.0 looks similar to Apple's iPad Air 2, but is considerably more affordable.

brightness over Wi-Fi, the Tab S2 lasted only 5 hours, 33 minutes. For contrast, last year's Tab S got 11 hours, 52 minutes, of video playback, and the iPad mini 3 endured for 5 hours, 45 minutes.

The tablet also comes with the typical suite of Samsung bloatware. You get 32GB of storage (plus the microSD slot), with about 6.5GB taken up out of the box. Preloaded bloatware includes Milk Music, Samsung+, and Galaxy Apps. It's toned down a bit from previous devices, but little of it is necessary and most of it cannot be deleted. Thankfully, Samsung's TouchWiz UI customizations have been scaled back a bit as well.

PERFORMANCE AND CONCLUSIONS

The Tab S2 runs Android 5.2 Lollipop and is the powered by the same processor as the Galaxy Note 5: an eight-core Exynos 5433. That makes it a very powerful device. On the AnTuTu Benchmark test, which measures overall performance, the tablet scored an impressive 52,137, beating out last year's Galaxy Tab S 8.4 (35,495) and even the previous champ, the Asus ZenPad S 8.0 (45,891). This is a welcome improvement, as one of our biggest knocks against last year's Tab S was its processing power. Games like Asphalt 8 felt buttery-smooth.

For network performance, I tested Wi-Fi download and upload speeds right next to our lab's FiOS router, and then behind a wall 20 feet away. Next to the

router I got fantastic speeds of 61.93Mbps down and 58.15Mbps up. Speeds dropped when I was farther away, but they weren't terrible: 17.58Mbps down and 7.5Mbps up.

The 8-megapixel camera on the back of the Tab S2 is quite good, and shutter speeds are fast in normal light. You'll see a surprising level of detail shooting outdoors, though low-light performance isn't as strong. The 2.1MP front-facing camera is quite strong as front-facing tablet cameras go, and just right for Google Hangouts, Skype, or other video calls.

With the Galaxy Tab S2, Samsung has upgraded its flagship tablet in almost every meaningful way. You get a more powerful processor, a display that remains one of the best you can find, and hardware that's lighter, thinner, and more beautiful than ever before, all for the same price as last year's model. If you're looking for something a little less pricey, the aforementioned ZenPad S 8.0 gets you very respectable performance and 64GB of storage for $299. But if you can handle the extra money, the Tab S2 should be at the top of your list.

BEN RADDING

“With the Galaxy Tab S2, Samsung has upgraded its flagship tablet in almost every meaningful way.”

Acer Aspire Switch 10 E
(SW3-013-11N8)

$349.99 (as tested)

●●●●○

Add Storage to This Hybrid With the Included Keyboard

PC MAGAZINE EDITORS' CHOICE

The Acer Aspire Switch 10 E is a full-featured, detachable-hybrid Windows tablet for people who just can't bear to be without a hardware keyboard. And the keyboard dock adds much-needed storage, so you don't have to leave your music, photos, and videos behind when you travel. Given its sub-$350 price, you know that this 10.1-inch tablet isn't going to be a speed demon, but it has enough extra features to be worthwhile.

DESIGN AND FEATURES

When docked to its keyboard, the Switch 10 E looks like a compact laptop. The gray polycarbonate top and bottom lids are textured for a better grip, and the

keyboard deck and screen bezel have a matte-black finish. (It's also available in other colors, such as light blue or violet.) The tablet weighs 1.4 pounds by itself, and a little more than 2.8 pounds with the keyboard dock attached. The tablet measures 7.1 by 10.31 by 0.43 inches (HWD) alone, and increases to about 1 inch thick when you add the keyboard. The tablet is a bit top-heavy, so if you open it all the way to the hinge's limit, it may tip over. That said, it's better balanced than its predecessor, the Switch 10.

Like the Switch 10, the Switch 10 E has a magnetic latch. Both the Asus Transformer Book T100TA and the larger Asus Transformer Book T200TA-C1-B use a more finicky locking mechanism. You can lift the Switch 10 E by its screen, and the sturdy magnetic latch won't disengage. You need to pull on both the screen and the keyboard to detach the two.

You can also attach the tablet to the keyboard with the screen facing in the opposite direction, letting you view videos on the tablet with the keyboard out of sight. The system's modes include the traditional Notebook mode, Tablet mode (either with the tablet detached or backed by the closed keyboard), Tent mode, and Display mode.

At 1,280 by 800, the 10.1-inch screen's resolution is lower than we've seen on some other tablets. And it has a 16:10 aspect ratio, as opposed to 16:9 for 1,366 by 768. That means webpages and Office documents will display more information when the tablet is held in landscape orientation, but 16:9 videos will have black bars above and below the picture. You're unlikely to notice the difference in casual use, though.

Acer Aspire Switch 10 E (SW3-013-11N8)

PROS Long battery life. Good display. Included keyboard adds storage. Solid connectivity. Dual-band Wi-Fi.

CONS Top-heavy design. No USB 3.0 ports. Micro HDMI port requires adapter. Operating system is 32-bit. Some bloatware.

FOUR-WAY DISPLAY

The hinge on the Acer Aspire Switch 10 E lets you use it in any of four distinct display modes.

The Gorilla Glass–covered In-Plane Switching (IPS) panel is very crisp, with good viewing angles and a responsive ten-point touch system. Acer includes a Bluelight Shield mode, which shifts on-screen colors from blue to yellow to ease eyestrain. There's also an Extra Contrast mode for when you use the system outside or in a sunlit room.

Given its price, the Switch 10 E's other features are understandably light. There's only 2GB of memory and a 32-bit version of Windows 8.1 with Bing. The tablet will start to slow down if you keep a lot of browser tabs open or if you try to edit a lot of photos simultaneously, but most Office and day-to-day programs should run just fine; in our testing, the Switch 10 E proved itself perfectly capable compared with other inexpensive tablets.

The tablet and keyboard dock together provide ample storage. There's a 64GB solid-state drive (SSD) in the tablet that acts as its boot drive, along with an extra 500GB 5,400rpm SATA hard drive in the keyboard. This is an improvement over other detachable tablets. For example, the Asus T200TA-C1-BL comes with an empty drive bay in its keyboard. Tablets like the Asus T100TA, the Acer Switch 10, and the Dell Venue 10 Pro Tablet 5000 Series lack any extra storage capacity in their bases. Acer's SwitchLock utility locks the hard drive automatically when you undock the tablet. That secures the hard drive, even if you lose the docking keyboard, or if the hard drive mechanism is removed from the keyboard.

Connectivity is solid, with some caveats. The tablet uses a micro USB 2.0 connector for charging, and there is a USB 2.0 port on the keyboard dock for mice and hard drives. Neither one is a full-speed USB 3.0 port, so any file transfers will take some time; we found that transferring files via microSD card was faster. The tablet portion has a micro HDMI port, so you'll need an adapter to connect the tablet to an HDTV. Integrated 802.11a/b/g/n dual-band Wi-Fi and Bluetooth 4.0 handle wireless connections.

You can free up some storage space on the SSD by deleting preinstalled programs. There are tiles on the Start screen from Amazon, eBay, and Hulu Plus, and apps include Skype, Evernote, Netflix, and Amazon Kindle. You get a one-year subscription to Microsoft Office 365, which needs to be activated using an included code. Acer covers the Switch 10 E with a one-year warranty.

PERFORMANCE

The Switch 10 E comes with a quad-core Intel Atom Z3735F with Intel HD Graphics. The processor isn't as advanced as the Intel Atom x7 in the Microsoft Surface 3, but it's fast enough for everyday tasks. The system scored a respectable 1,481 on the PCMark 8 Work Conventional test, on par with the Dell Venue 10 Pro Tablet 5000 Series (1,310), the Lenovo Yoga Tablet 2 AnyPen With Windows (1,379), and the Toshiba Encore 2 Write (1,497). The Acer T200TA, with a faster Atom Z3745 CPU, did a little better (1,719 points).

The system's 32-bit operating system and 2GB of memory prevent it from running our CineBench and Adobe Photoshop CS6 tests, but it was able to complete the Handbrake test in a relatively leisurely time of 9 minutes, 10 seconds. As with other tablets in the category, 3D gaming scores were in the single digits. It's best to stick to browser-based games on this tablet.

Battery life is where the Switch 10 E shines. It lasted an impressive 13 hours, 30 minutes, on our rundown test, handily beating both its nearest competitors, the Asus T100TA (11:20) and the Microsoft Surface 3 (9:52).

CONCLUSION

With its long-lasting battery power, more storage than its rivals, and the extra versatility you get with a keyboard dock, the Acer Aspire Switch 10 E a winning entry-level tablet. We gave the Asus Transformer Book T100TA a slightly higher rating two years ago because it faced less stiff competition, but the Aspire Switch 10 E's lower price, longer battery life, and 500GB of additional hard drive storage make it a much better buy today.

JOEL SANTO DOMINGO

Don't Hide This Router, but Beware Its Limitations

Google OnHub

$199.99

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With the OnHub, Google officially enters the home Wi-Fi router arena. Codeveloped with TP-Link, the OnHub is a dual-band model with a sleek form factor that makes it look nothing like a traditional router. It contains more than a dozen antennas, is a cinch to install, and uses a thoughtfully designed app to control certain network functions. Unfortunately, its performance is mixed, and it lacks many standard router management features, including parental controls, guest network capabilities, and VPN services. The OnHub is equipped with circuitry to control ZigBee home automation devices and it has a Bluetooth 4.0 radio, but these features were not enabled as of this writing. Moreover, the OnHub will only accommodate one wired LAN connection, and its lone USB port is reserved for recovery purposes.

DESIGN AND FEATURES

Google touts the OnHub as a router that is designed to be out in the open, and deservedly so. Whereas most models are nondescript black boxes with multiple antennas protruding from the top or sides, the OnHub uses a cool-looking, cylindrical casing and contains no external antennas.

It measures 7.5 inches tall and 4.6 inches in diameter, and sports a dark blue removable plastic shell (it also comes in black).

The top of the router contains a speaker that produces a series of weird techno sounds during setup and a light ring that emits a subtle glow to let you know the router's status. An amber color indicates that something is wrong and you should go to the Google On app to troubleshoot the issue; a blue glow indicates that the router is ready for setup; and teal tells you that the router is on and active.

The OnHub is an AC1900 router that can (theoretically) provide up to 600Mbps on the 2.4GHz band and up to 1,300Mbps on the 5GHz band. Under the hood are a 1.4GHz dual-core processor, 4GB of eMMC flash storage (for software updates), and 1GB of DDR3 memory. There are also six 2.4GHz antennas and six 5GHz antennas arranged in a circular pattern for maximum coverage in all directions, a reflector antenna that boosts signal strength, and a congestion-sensing radio that continually polls wireless activity and changes channels to increase performance. The OnHub is also equipped with ZigBee and Bluetooth antennas, but neither is enabled; Google told us it plans to add support for both in the future, but has not provided a timeframe.

You have to remove the shell to gain access to the OnHub's meager assortment of I/O ports. These include one Internet (WAN) port, one wired Ethernet port, a USB 3.0 port, and a power jack. The single Ethernet port means you can only connect one wired device to the OnHub, whereas similarly priced AC1900 routers, such as the D-Link Wireless AC1900 Dual-Band Gigabit Cloud Router, come with four wired ports. The USB port is reserved for recovery use, which means you can't use it to add an external drive or printer to your network.

Google OnHub

PROS Sleek look. Easy setup. Well-designed app. Solid close-range performance.

CONS Only one wired port. No PC, Web browser app. Lacks many standard management options. Some features not yet enabled.

SPEAKER UP
The speaker on the top of the Google OnHub produces some interesting sounds during the setup process.

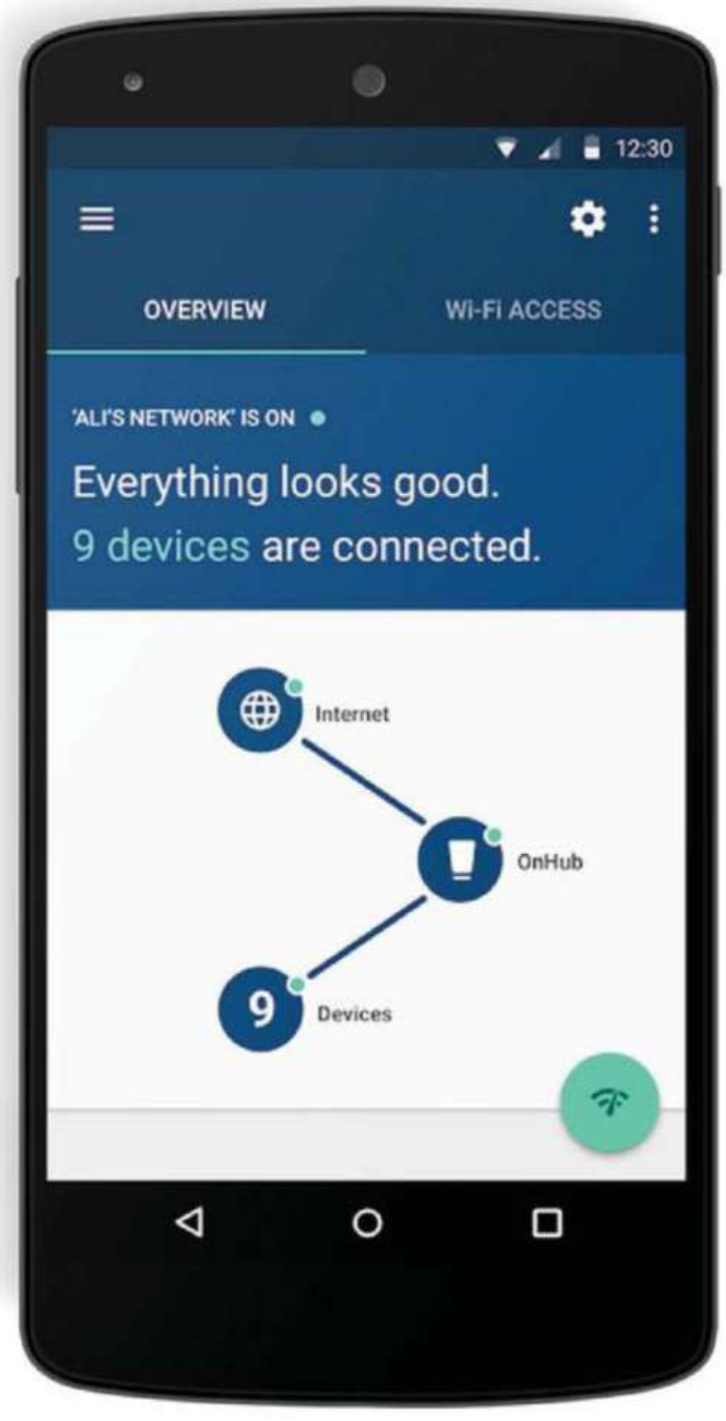
GOOGLE ON APP

Whereas most routers are managed via a Web-based interface, for the OnHub you use the free Google On app for iOS or Android (which does not currently offer Web controls). The app is very easy to use and offers plenty of tips and explanations for its various settings. The main page displays an overview with a diagram of your connected devices. It alerts you to any issues and offers a brief explanation and a link to the Help Guide to resolve those issues. You can click on any device to see its IP address, MAC address, connection status, and upload and download history. You can also view real-time data usage for each device and assign traffic priority for 1-, 2-, or 4-hour periods.

Tapping the small green icon at the bottom of the page launches a network check utility that measures Internet upload and download throughput and Wi-Fi efficiency (how much potential Internet speed your mobile device is able to use at any given location in your house). Tapping the Wi-Fi Access tab displays the router name and password and gives you the option of sending this information to friends and family via email, text message, or Facebook.

Network settings are sparse. You can assign a custom IP address or use an automatic setting (default), enable or disable DHCP, Static IP, and PPoE WAN settings, and set up port forwarding, but there are no parental controls or guest network options, nor are there any VPN settings. Also missing are firewall settings, options to block specific sites, and the ability to create and display separate SSIDs for each band and assign devices to a specific band.

APP-BASED MANAGEMENT
The Google On app is user-friendly and easy to use, which is good—it's the only way you can manage your OnHub.



INSTALLATION AND PERFORMANCE

Installing the OnHub couldn't be easier, but the process requires a valid Google account. To start, download the app and sign in using your Google

account username and password. Follow the on-screen instructions to plug in the router's power and Ethernet cable, then get the router's setup code and SSID from its base. Go to your mobile device's Wi-Fi settings, connect to the router's SSID, and return to the Google On app to name the router and create your network. Use your Wi-Fi settings to connect to the router, and you're done. Google suggests putting the OnHub out in the open, preferably at eye level for optimal range, but most homeowners will be limited in their location choices unless their home is wired for Ethernet.

I usually run throughput tests on each band of a multiband router, but because the OnHub doesn't let you specify a band, my results are based on the router's ability to select the best wireless channel for optimal performance. On my close-proximity (same-room) test, the OnHub delivered an impressive throughput of 297Mbps, easily beating the D-Link DIR-880L's 144Mbps and the Netgear Nighthawk X6 AC3200 Tri-Band WiFi Router's 171Mbps, both while operating in 802.11ac (5GHz) mode. But it couldn't touch the D-Link AC3200 Ultra Wi-Fi Router (558Mbps) or the Asus RT-AC3200 Tri-Band Router (452Mbps).

The OnHub didn't fare as well on my 30-foot throughput tests. Its throughput speed of 38.6Mbps significantly trails that of the D-Link DIR-880L (140Mbps), and is only about half as fast as what we saw from the Amped Wireless High Power 700mW Dual Band AC Wi-Fi Router (75Mbps). The D-Link DIR-890L/R blew them all away with 310Mbps.

PART ROUTER, PART ART PIECE
The OnHub has a unique look that the style-conscious will love, but it lacks key features found on most other routers.

The OnHub has the potential to be a true all-in-one smart router and hub for the connected home.

CONCLUSION

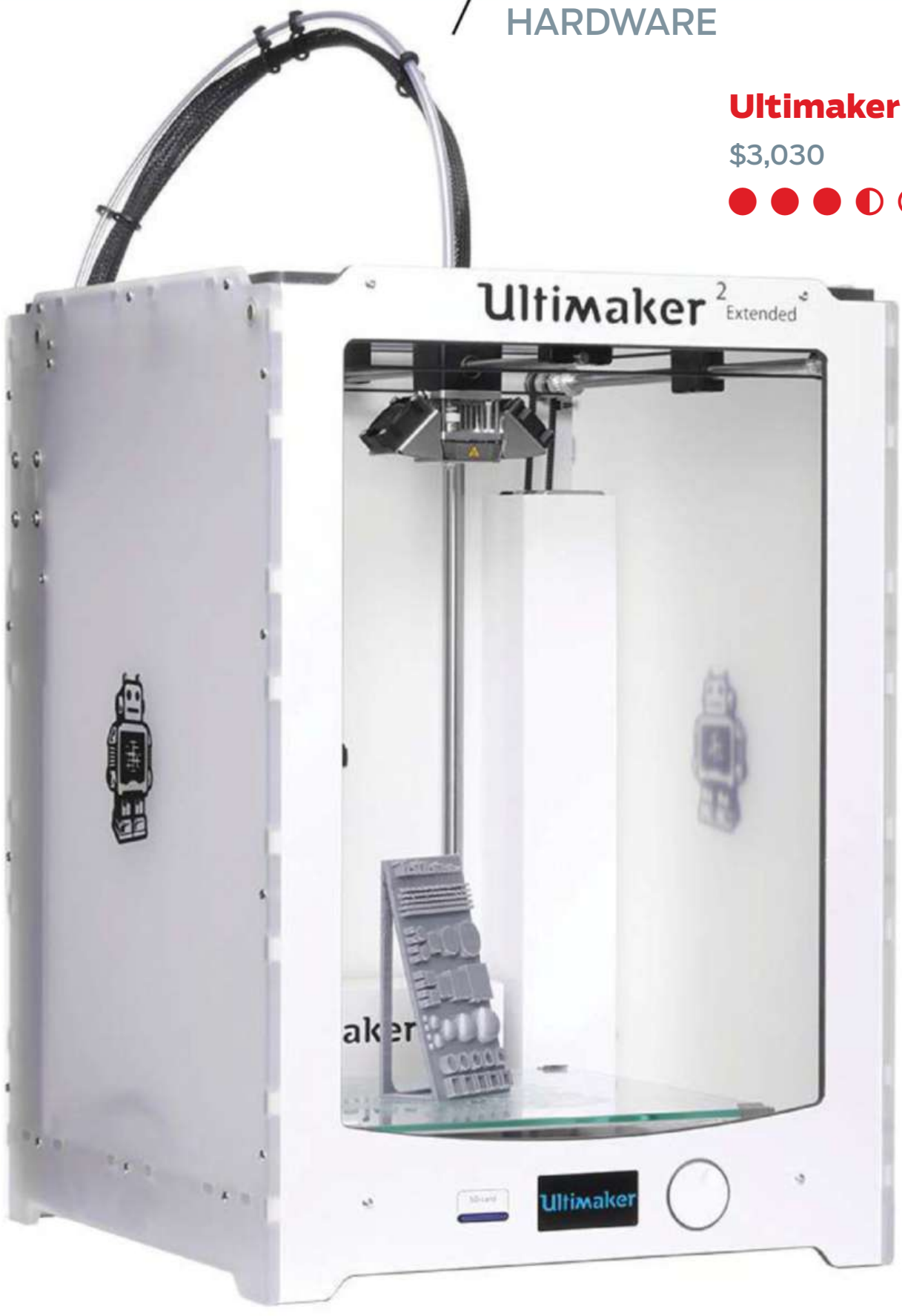
The Google OnHub is designed for non-tech-savvy users looking for a quick and easy way to bring dual-band networking to the home, and in that respect it succeeds. Its unique design lets you place it anywhere in the house (as long as you have a wired Ethernet connection there) and its user-friendly app makes it easy to set up and monitor your home Wi-Fi network. That said, I expect more advanced management options from a $200 router, as well as a USB port that actually lets you connect peripherals. And although its performance at close proximity in testing was good, it could do better at longer ranges.

Once Google gets around to enabling ZigBee and Bluetooth functionality, the OnHub has the potential to be a true all-in-one smart router and hub for the connected home, but you still won't get the blazing throughput speeds you would from our Editors' Choice, the D-Link AC3200 Ultra Wi-Fi Router. Granted, it'll cost you around $100 more, but the D-Link DIR-890L/R offers tons of management features and plenty of I/O ports.

JOHN R. DELANEY

Ultimaker 2 Extended

$3,030



Get Spacious Build Area on This Touchy 3D Printer

The high-end model in the Ultimaker 2 line of 3D printers, the Ultimaker 2 Extended ($3,030 list), has the largest build area of the lot. This means that it can print taller objects and uses the highest resolution of any fused filament fabrication (FFF) 3D printer we have tested. Like the original Ultimaker 2, our Editors' Choice for high-end 3D printers,

and the compact Ultimaker 2 Go, the Ultimaker 2 Extended is simple to operate with a dial and monochrome LCD. But it's more difficult to keep up and running, and its print quality can be inconsistent.

DESIGN AND FEATURES

The Ultimaker 2 Extended is a handsome, single-extruder 3D printer that measures 19.2 by 14.1 by 13.5 inches (HWD), 4 inches taller than the Ultimaker 2, and weighs 26 pounds, 7 ounces. It has an open front and top, translucent white sides bearing Ultimaker's cool robot logo, and a well-lit interior thanks to the strings of LEDs running down the front inside edges. Thanks to its extra height, the Ultimaker 2 Extended's build area of 12 by 9 by 8.9 inches (HWD) is slightly larger than the Ultimaker 2's (8.1 by 8.8 by 8.8 inches).

Unlike most 3D printers, which use 1.75mm plastic filament, the Ultimaker 2 Extended uses 3mm filament. The extrusion system is specifically designed for that thickness of filament. We printed with the polylactic acid (PLA) filament that was supplied with the printer; it also supports printing with acrylonitrile butadiene styrene (ABS).

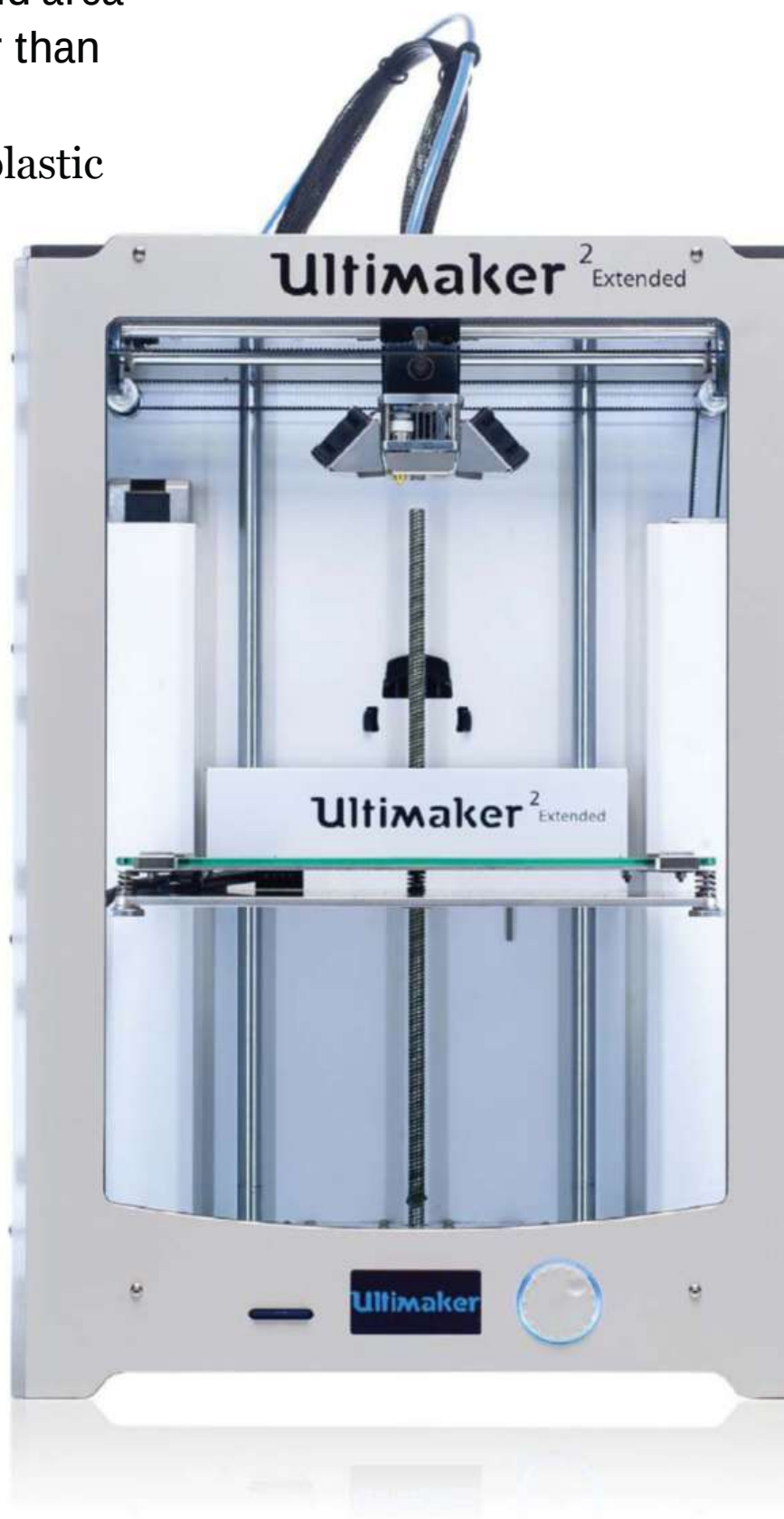
SETUP

Setup is fairly simple. It consists of snapping the filament spool holder in place in back of the printer, fastening the glass plate that serves as a print bed to the build platform with clips, connecting the power supply, turning on the printer, and then following the First Run Wizard instructions on the printer's five-line display, which is controlled by a dial next to it. It first helps you level the build plate, moving the extruder to three different positions above the build plate and having you turn the dial and tighten screws until the extruder is 1mm

Ultimaker 2 Extended

PROS Large build area. Heated print bed. High resolution. Generally good print quality.

CONS Extrusion problems in our testing. Printing via USB cable is not officially supported, may be problematic.



from the plate at each position (it doesn't have to be exact). You then repeat the process, lowering the extruder until a sheet of paper fits, with slight resistance, between the extruder and build plate. Next, you put a filament spool in place in its holder, and push the free end of the filament into the filament feeder until it's grabbed between a wheel and gear. Once the filament catches, it shoots through a tube to the extruder, which heats up the plastic until it melts and comes out the nozzle. You then select one of the test 3D object files from the memory card and press Print.

The Ultimaker 2 Extended has a heated print bed, which is useful for keeping the corners of objects from curling up as they print, particularly when using ABS. When you first set up the printer, you are asked to apply some glue from an included glue stick to the glass at the center of the build platform. This makes it easy to remove objects after each print job.

PRINTING

I selected the Ultimaker robot from the files on the included SD card as my initial print. This object, a small, 3D version of the Ultimaker logo, printed out smoothly but for one place where it seemed to have missed printing a layer or two, creating a horizontal band encircling the object that was only partially filled with plastic. When I started the second test print, only a trickle of plastic briefly emerged from the nozzle and then stopped, and I was unable to coax it to resume extrusion by using the Move Material option from the Maintenance menu on the printer's display. I was able to extract the filament and clean the tube, which was an involved (if not difficult) process that kept things running smoothly for maybe half a dozen prints before I needed to do it again.

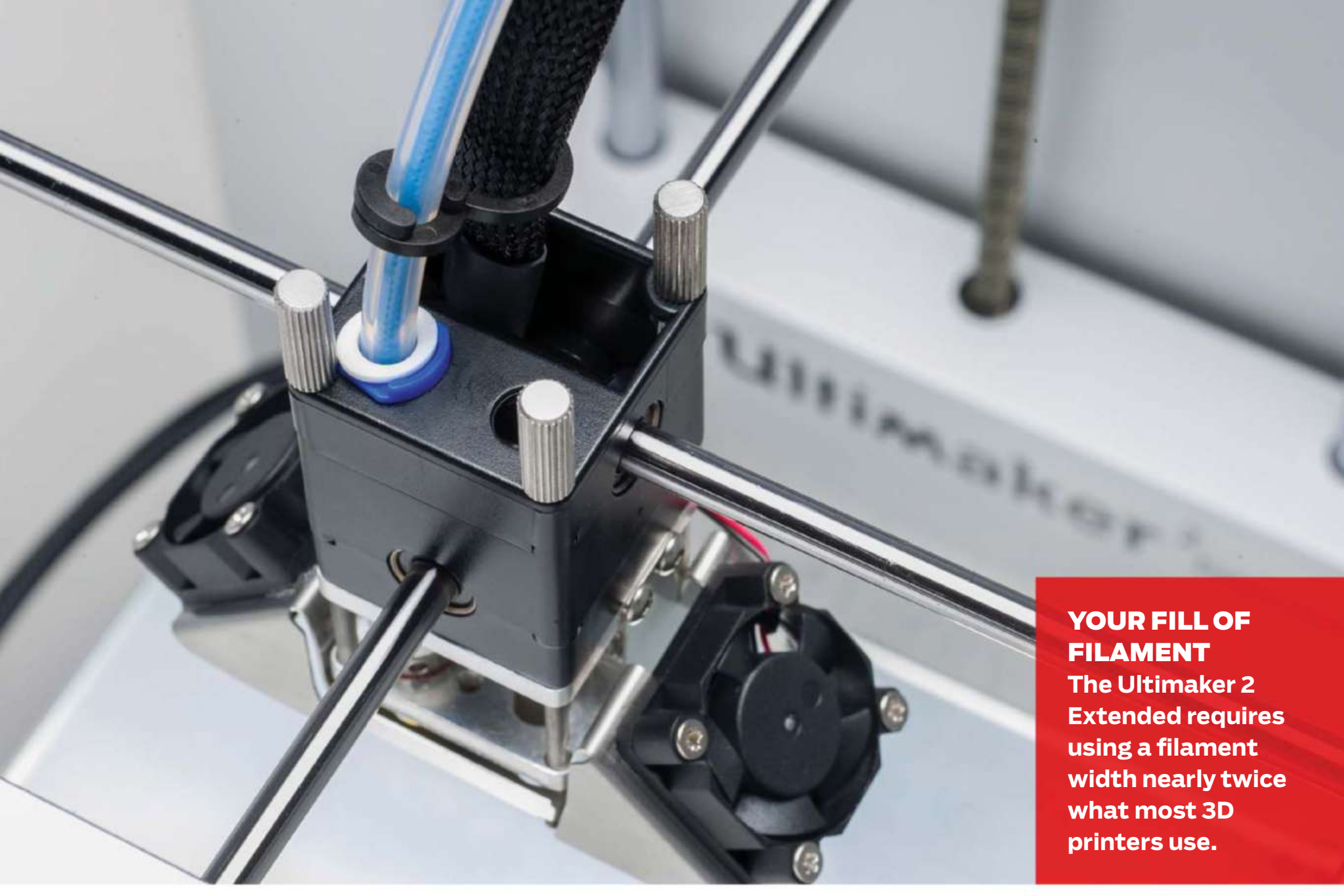
One thing that sets the Ultimaker 2 Extended apart from other FFF 3D printers we've tested is its high maximum resolution, 20 microns. Most 3D printers offer a maximum resolution of about 100 microns, with a micron being 0.001mm. By default, the Ultimaker 2 Extended's resolution is 100 microns, but under the Quality tab in the printer's Cura software you can enter any value down to 20 microns. Ultimaker recommends 60 microns as the high-resolution setting, to provide a good balance between print quality and printing time. I tested mostly at normal resolution (100 microns), with one print at high resolution (60 microns), and it took nearly twice as long to print the same object at high resolution as at normal.

Overall print quality was reasonably good, with little trace of layering, though the Ultimaker 2 did worse than usual at printing underhangs, and fine detail was lost in a couple of prints. In one print of a frog, the front legs were partially detached from the frog's body. I noticed no difference between the normal- and high-resolution prints of the same object, so I'd recommend sticking to the normal setting.

The Ultimaker 2 Extended has an SD card slot, and comes with a 4GB card with a few test files preloaded. Ultimaking Ltd. offers its version of Cura, a popular open-source software package for slicing 3D images, as a free download. The software is easy to use, and lets you resize and move objects, load multiple objects for printing, and change the resolution and other settings.

The printer has a USB port, but the USB connection is intended for firmware updates rather than printing. Although the latest version of Cura has a Print to USB option, USB printing is neither officially supported nor recommended by Ultimaking Ltd., which claims it's buggy; I was unable to make it work in my tests.

BIGGER ISN'T ALWAYS BETTER
The Ultimaker 2 Extended can print large objects, but extrusion issues and other problems keep it from being totally hassle-free.



YOUR FILL OF FILAMENT

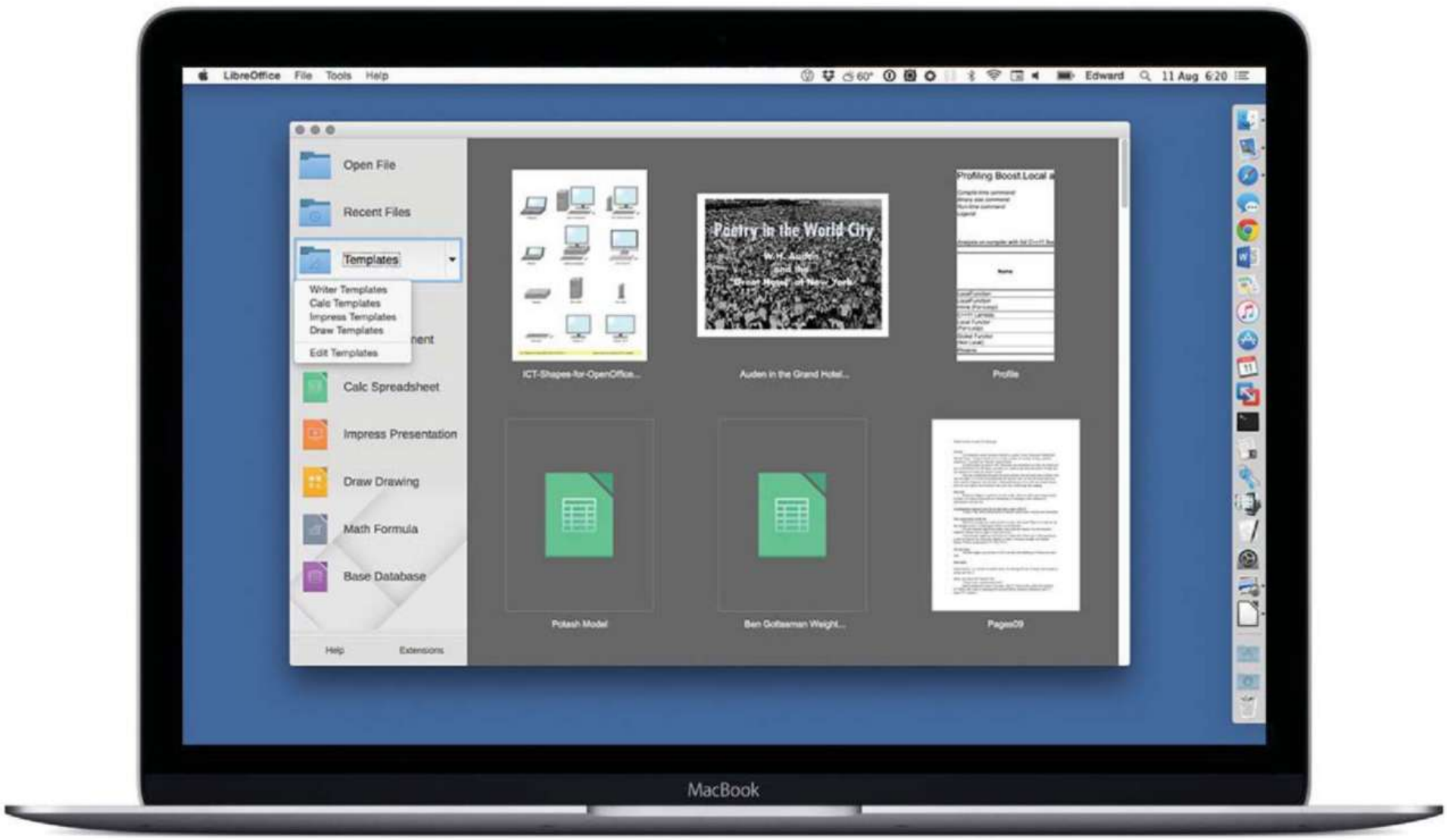
The Ultimaker 2 Extended requires using a filament width nearly twice what most 3D printers use.

CONCLUSION

At best, the Ultimaker 2 Extended printed objects with good detail and quality, although it struggled with a couple of jobs, including one that it completely botched. The two stints in which little or no molten plastic emerged from the nozzle, twice bringing printing to a halt until I could resolve them, were more of a concern. There are several potential causes for under-extrusion, and I had to go through several rounds of trial and error each time before the printer was up and running again.

The Ultimaker 2 Extended can print objects taller than any other 3D printer we've reviewed, but it didn't offer the trouble-free printing experience we had with the Ultimaker 2 and the LulzBot Mini. For high-end 3D printers, suitable for hobbyists and professionals, the original Ultimaker 2 remains our Editors' Choice. If you need to print tall objects, and don't mind the risk of some downtime in case you need to get a balky extruder up and running now and then, the Ultimaker 2 Extended is worth exploring.

TONY HOFFMAN



This Improved Free Suite Is Still No Microsoft Office

LibreOffice 5

Free

LibreOffice, the leading free desktop-style alternative to Microsoft Office, just got a new version number, a more modern-looking interface, improved import and export filters, and a vast number of bug fixes. But don't get the idea that LibreOffice 5 is massively different from its earlier versions, or that if you're not using LibreOffice now, version 5 will make you want it. If, on the other hand, you or your business can't afford or don't want to use a proprietary, for-pay office suite, LibreOffice 5 is your best bet.

VERSION CONFUSION

Until late in its development, LibreOffice 5 was known by the version number 4.5. If you're using version 4.x now, this one is a smooth, mostly hassle-free upgrade. If you tried LibreOffice 4.x and found it wanting, the new version won't change your mind. LibreOffice now exists in versions for both 64- and 32-bit Windows, as well as for OS X and many varieties of Linux. Versions for tablets and phones have been promised but are not yet available.

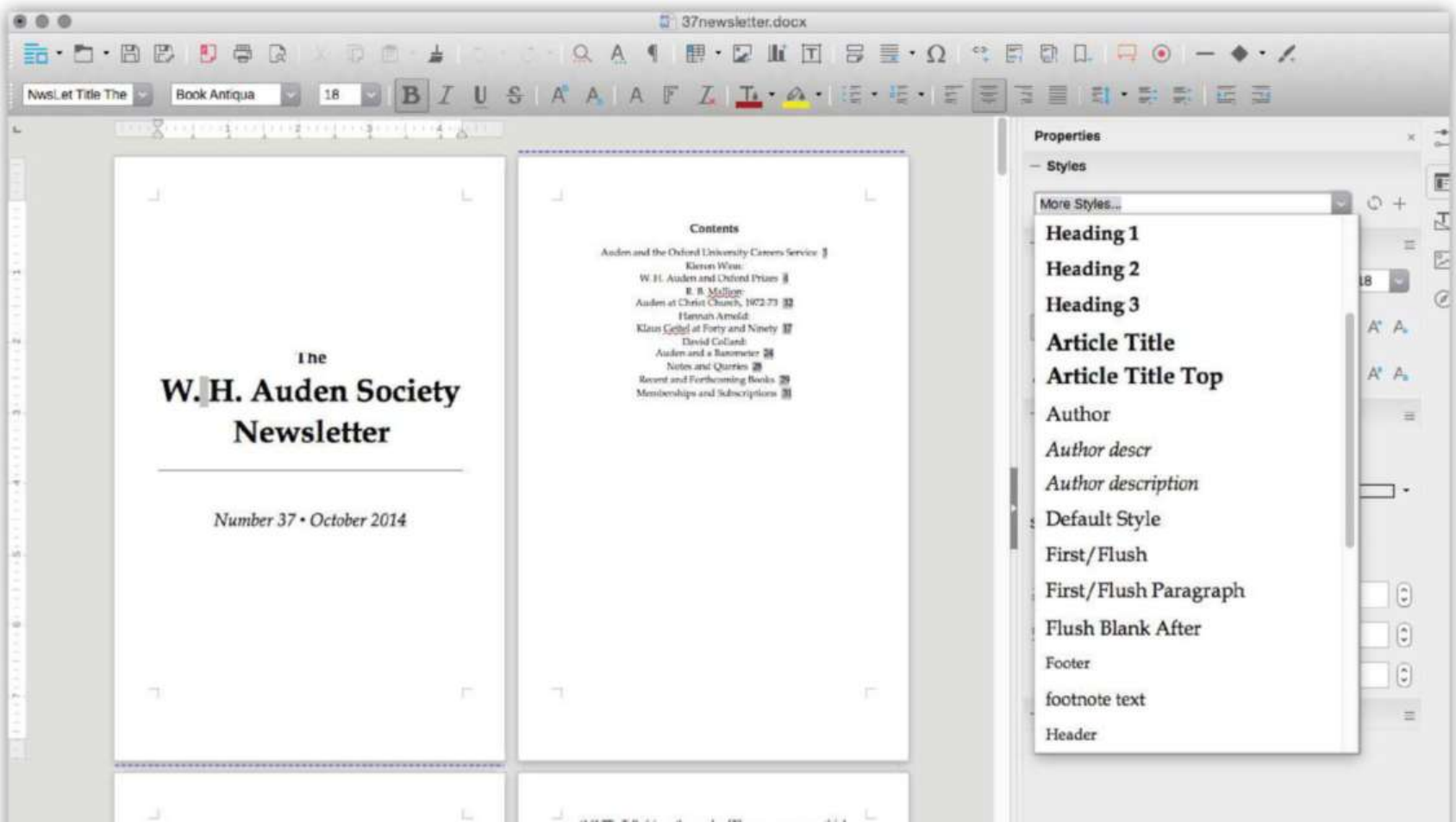
LibreOffice is a long-standing open-source project based on the old OpenOffice.org suite, which is still being developed as Apache OpenOffice but is far behind LibreOffice in features and reliability. The suite comprises a word processor called Writer, a spreadsheet called Calc, a presentation app named Impress, plus a drawing app (Draw), a math formula formatter and solver (Math), and a database app (Base) that creates flat-file databases and can manage or access almost any existing standard flat-file or relational database format. Under Windows you can launch each app separately or start the suite from a unified control panel with access to templates and recent files. Under OS X, you have to start from the unified control panel unless you're opening an existing file.

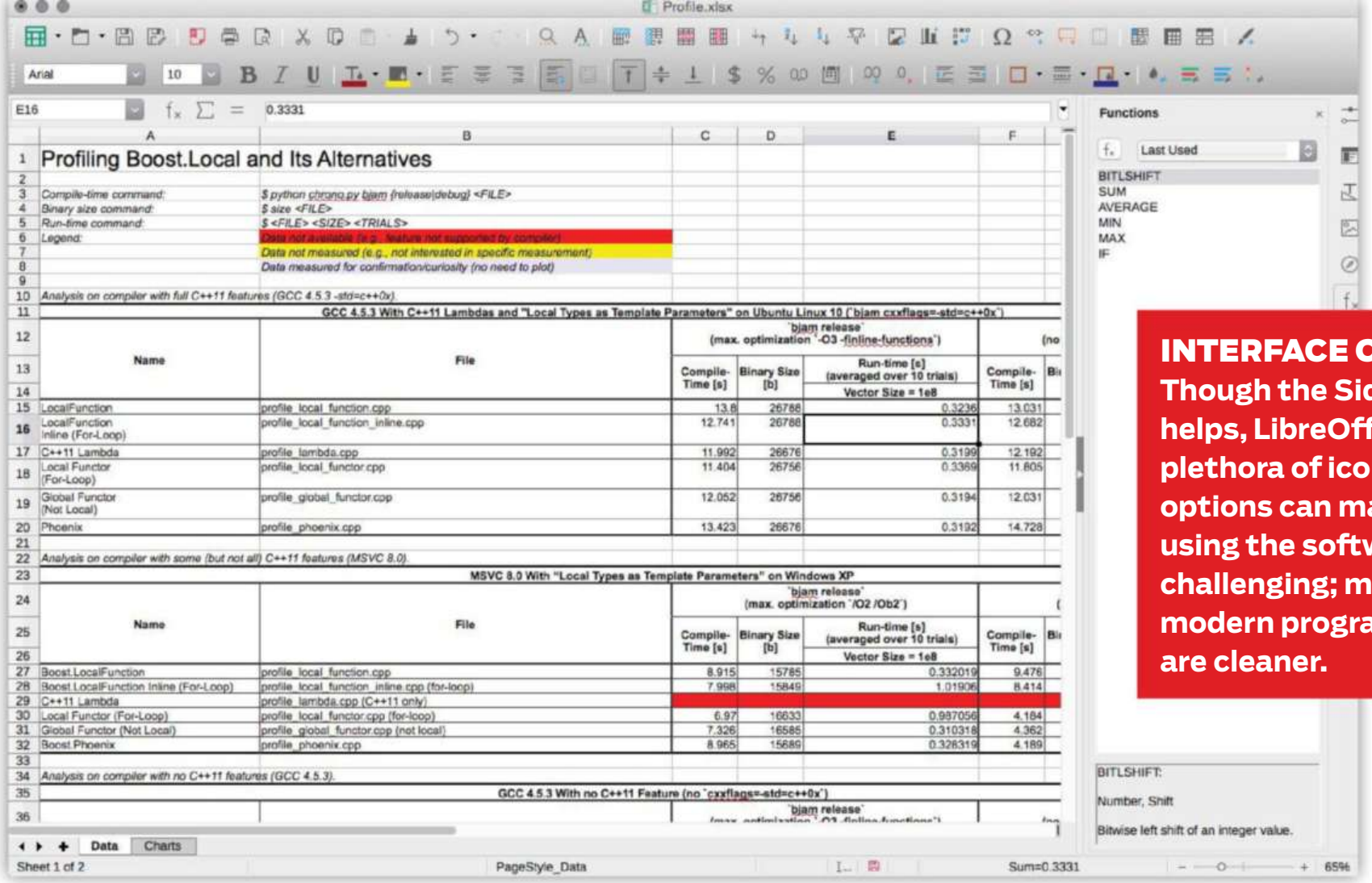
LibreOffice 5

PROS Open source. Available for Windows, OS X, Linux. Fast. Powerful. Opens virtually all legacy documents. Improved import and export features.

CONS Clunky interface. Confusing menu options. No cloud-, tablet-based versions.

ALMOST, BUT NOT QUITE...
LibreOffice 5 has lots of functionality, but is less elegant and potentially more frustrating to use than Microsoft Office.





INTERFACE CLASH
Though the Sidebar helps, LibreOffice's plethora of icons and options can make using the software challenging; most modern programs are cleaner.

BACKWARD COMPATIBILITY

One reason LibreOffice is worth having—even if you rarely use it—is that it can open virtually any legacy document format, and it may be the only Mac software that can open ancient files created by WordPerfect or obsolete versions of Microsoft Word. By default, LibreOffice saves documents in its native Open Document formats, although you can change a setting so that it always saves in Microsoft Office formats.

As the developers claim, the latest version improves on the software's Microsoft import and export filters. Almost every Word document and Excel worksheet that I opened in LibreOffice looked identical or nearly identical to the way it looks in Office.

OFTEN INELEGANT

What you don't get in LibreOffice is Microsoft-style convenience and elegance. LibreOffice still uses an overly cluttered toolbar interface similar to what Microsoft used up to Office 2003 (though you can reduce the clutter by customizing the toolbar if you have the patience and expertise to do so). This interface is now supplemented by a Sidebar of the kind familiar from recent Office versions and from Apple's iWork suite.

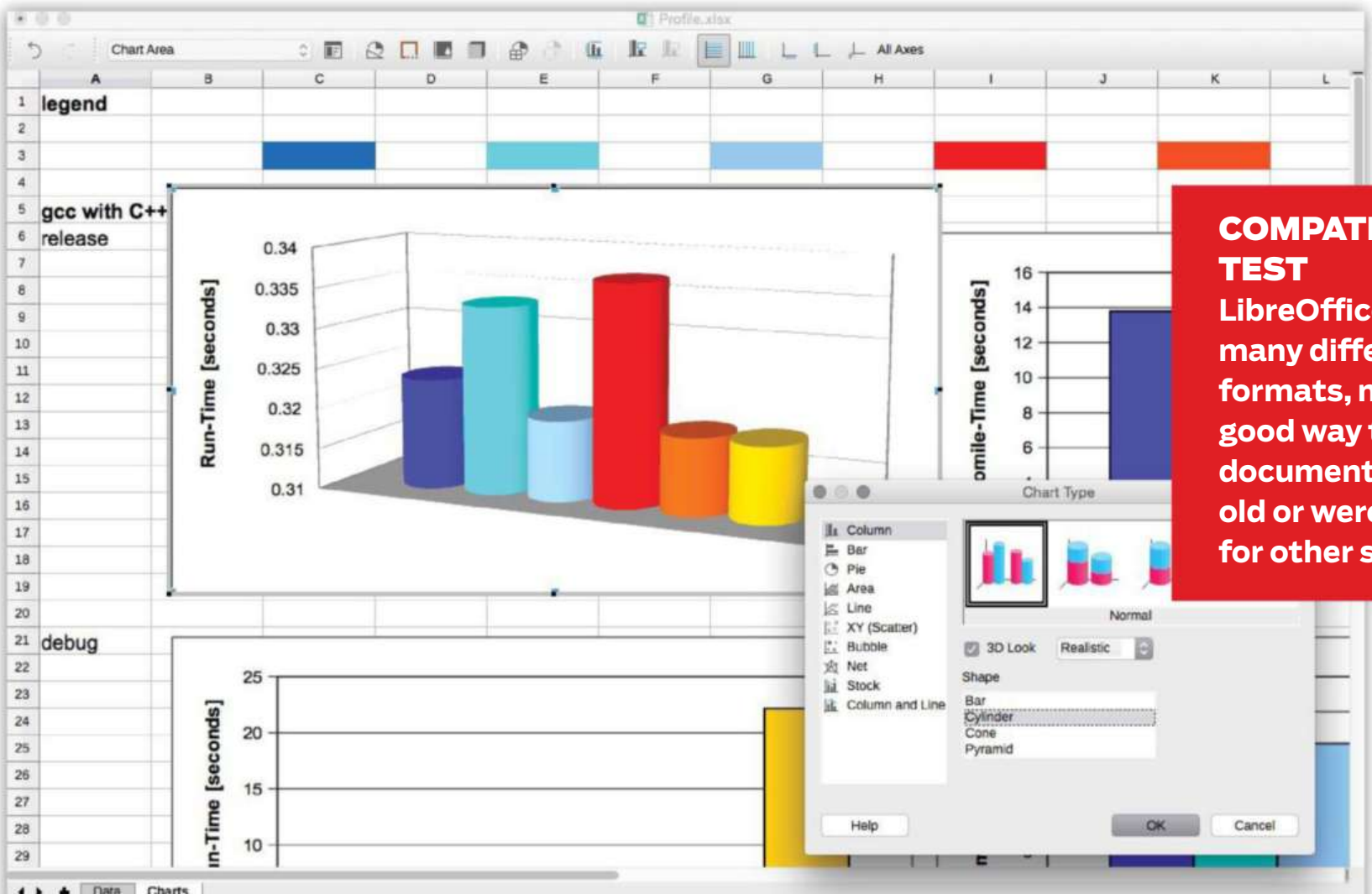
LibreOffice 5's Sidebar adds some much-need visual cues for features like formatting styles. This is a welcome advance, but the rest of the interface still uses crowded, sometimes incomprehensible menus that expert users might have enjoyed in 1985 but seem unfriendly today.

NEW FEATURES

Among the new features in LibreOffice 5 are some that you probably won't care about, like the ability to replace strings surrounded with colons (like ":scream:") with the standard matching emoji—provided that your OS provides the emojis, which older OSes don't. Some features, notably the display of databars in worksheets, are now easy to apply via menus, and conditional formatting can be exported to Excel format. Images can be cropped inside documents. LibreOffice claims to be able to import Apple's iWork documents, though only from iWork '09 and earlier. This import works well with word processing documents, but in my tests it failed badly with worksheets, typically importing only the first two or three rows and not displaying any error message to warn that the import had gone wrong.

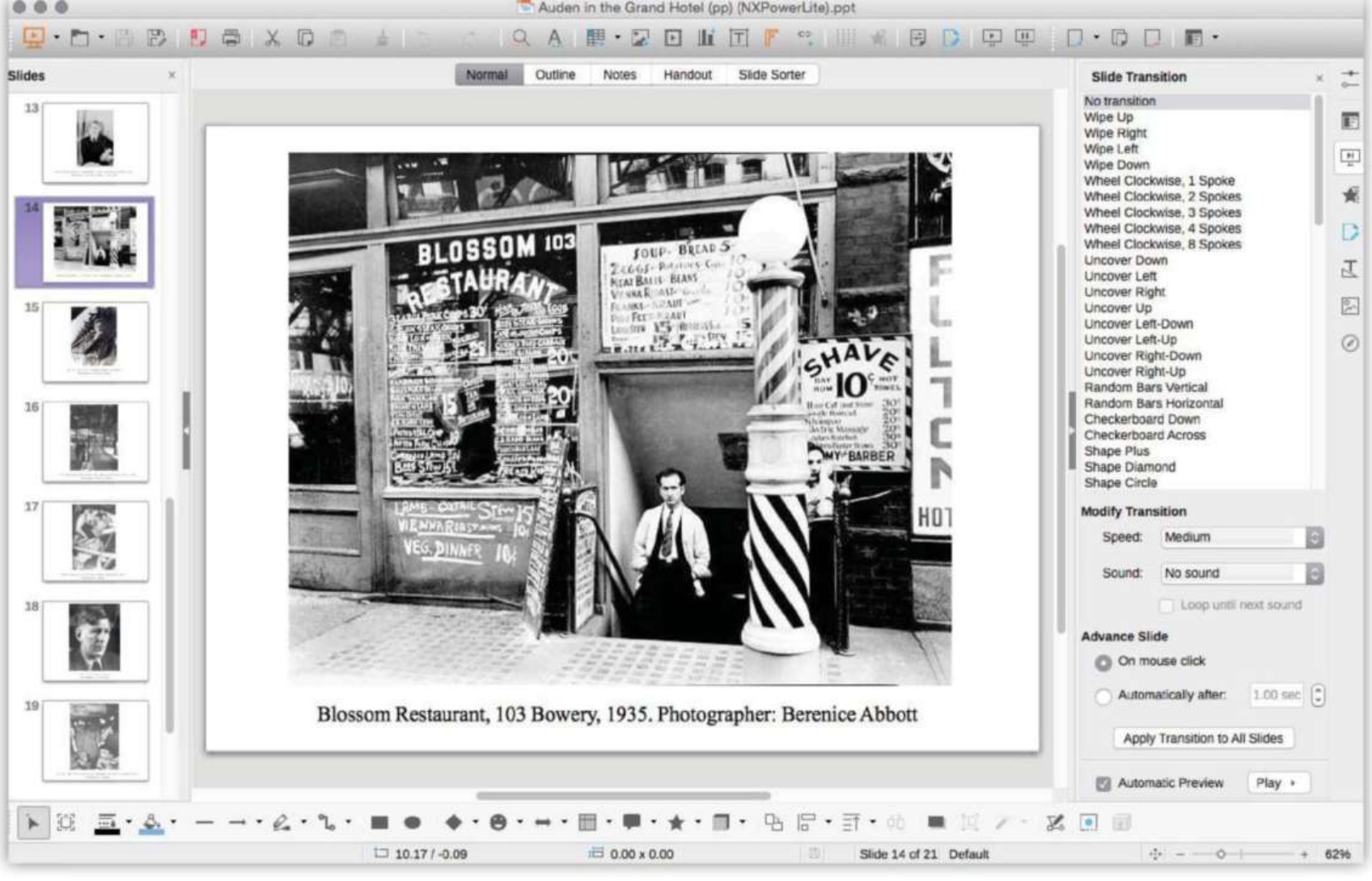
NO CLOUDS HERE

LibreOffice still doesn't have cloud-based versions like Microsoft Office or iWork, and it has only an experimental viewer app for Android. A lot of the improvements in LibreOffice 5 are said to have been made in preparation for cloud and Android versions, but no one is saying when they might arrive. Meanwhile, Microsoft Office has gleaming new versions for iOS, Android, and a cloud-based browser version, so LibreOffice has a lot of catching up to do. Also, Microsoft Office now includes support for gestures on tablets and touchpads, a feature that LibreOffice has begun working on but that won't arrive in the near future.



COMPATIBILITY TEST

LibreOffice can open many different file formats, making it a good way to edit documents that are old or were designed for other systems.



COMPETITION AND CONCLUSIONS

Aside from Microsoft Office, LibreOffice's main competition comes from Google. The cloud-based Google Drive and its office programs get more powerful all the time, but still can't match the flexibility and feature set of LibreOffice or other office suites. The one area in which cloud-based office suites are in the lead is in version management, with Google Docs (and cloud-based Office) automatically saving multiple versions of a file while you edit it. LibreOffice has a "Save New Version" feature, but you have to manage it by hand.

With all its limitations, LibreOffice 5 is the ideal solution for only a few special groups of users: governments or other organizations that don't want to rely on proprietary software for policy or security reasons; organizations that need to use the same software under Windows, OS X, and Linux; and anyone who doesn't want to pay for an office suite. For all those users, LibreOffice is fast, efficient, and reasonably powerful, though it won't win any beauty contests. For most users, Microsoft Office is the only answer, but LibreOffice still has an honored place in the software universe.

EDWARD MENDELSON

Panda Free Antivirus

Free

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Free Antivirus Software Good Enough to Pay For

PC MAGAZINE EDITORS' CHOICE

There's just no excuse for going without antivirus protection, especially when you can get a seriously effective antivirus utility for free. The 2016 edition of Panda Free Antivirus outperforms many of its commercial competitors, and remains our top pick.

GETTING STARTED

If you're familiar with Panda Free Antivirus, one look at this year's edition will be enough to tell you it's not the same as last year's. Instead of the dark background with multicolored buttons, the current product uses a white background with buttons and panels in shades of blue.

The biggest panel reflects your status and offers security statistics. Other panels let you launch scans, extend protection to other devices, and work with

other security features. Panda's paid products include full support for Mac and Android devices; on the free edition, pursuing the "Other devices" option gets you a free trial for Mac or a free, feature-limited edition for Android.

Installation is fast and simple, but you'll want to pay attention to the options. You need the Panda Security Toolbar for full protection, but you may not want to set Yahoo as your default search provider or the Yahoo-powered MyStart as your home page. (I should point out, though, that bundles like these provide the income that lets Panda offer its antivirus software for free.)

A full scan of my standard virtual machine test system took 1 hour, 10 minutes, quite a bit longer than the current average of 32 minutes. A second scan brought that time down to 30 minutes. A number of competing products manage to perform that second scan much more quickly, however. For example, a repeat scan with Trend Micro Antivirus + Security finished in less than 3 minutes.

LAB RESULTS

Although the independent testing labs don't necessarily put Panda's free edition to the test, its antivirus technology is the same as what you get in paid editions, so the results should be valid. Panda no longer participates in testing by ICSA Labs and West Coast Labs, but Free Antivirus achieved VB100 certification in eight of the last 12 tests by Virus Bulletin, with two tests skipped.

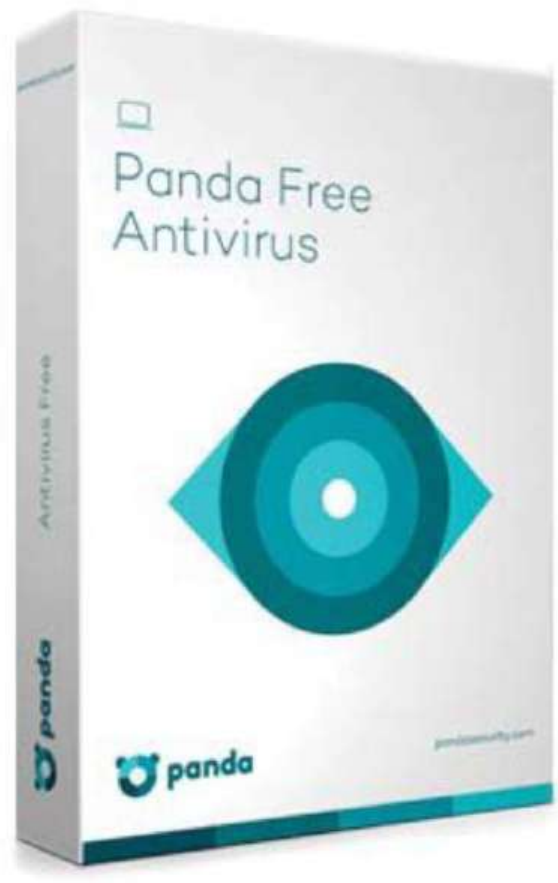
AV-Test Institute evaluates antivirus products on how well they protect against malware, how small an impact they have on system performance, and how little false positives affect usability, with 6 points available in each category. Panda earned top scores for protection and usability, and managed 5 points for performance, for a total of 17 points—quite good. But Avira Antivirus 2015, Bitdefender Antivirus Plus 2015, and Kaspersky Anti-Virus earned perfect scores of 18 points.

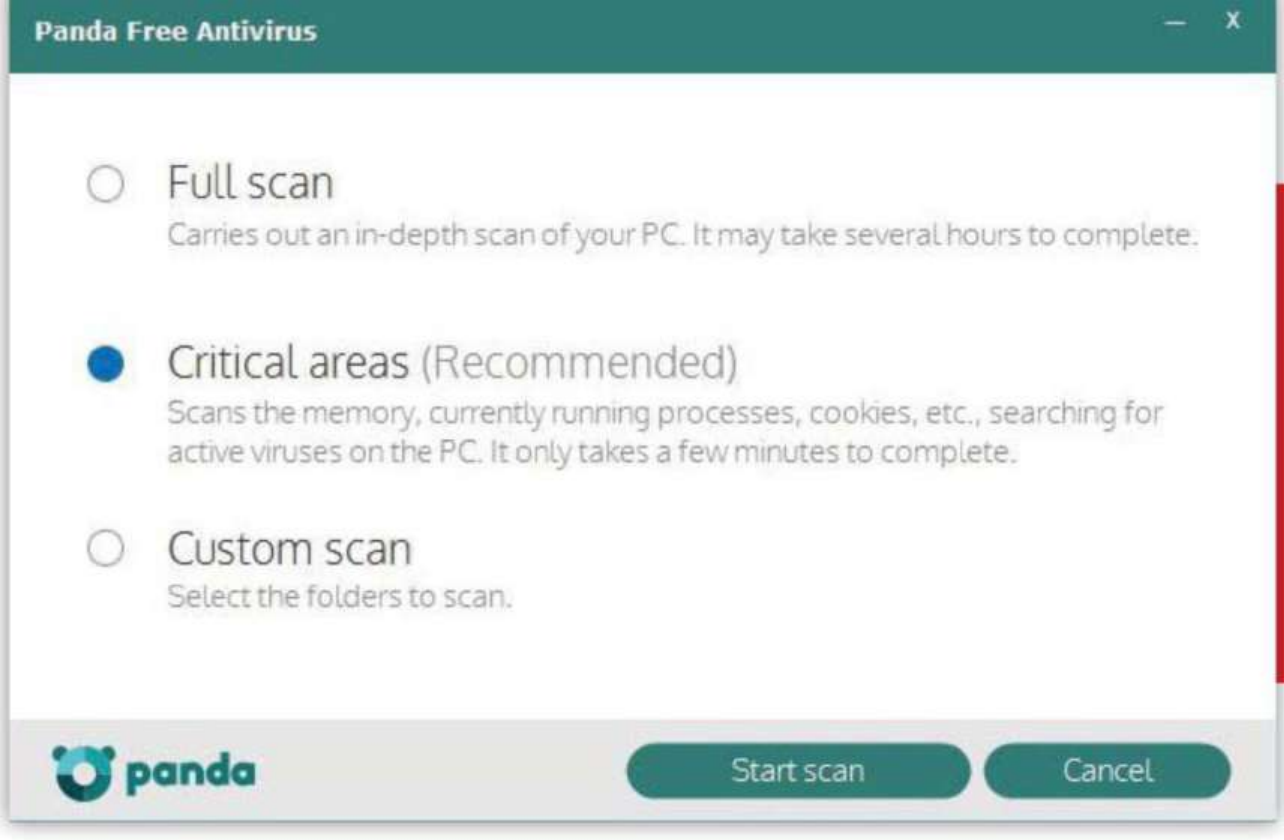
I look at a number of different tests performed by AV-Comparatives. Products that pass these tests earn a

Panda Free Antivirus

PROS Scored better than for-pay competitors in our own tests. Good scores from independent labs. Offers many useful features.

CONS Phishing protection score down from last year's.





SCAN CHOICES
Panda offers three different ways to scan your computer, but note that the full scan could take a long time to complete.

Standard rating; products that excel can earn Advanced or Advanced+. Panda took an Advanced+ rating in a test specifically measuring how thoroughly products clean up detected malware. It would have had Advanced+ in the dynamic whole-product test, but false positives knocked it down to Advanced. And it managed Advanced in the file detection and performance tests. These are good scores, but Bitdefender and Kaspersky earned Advanced+ ratings across the board.

MALWARE BLOCKING GOOD, PHISHING POOR

Panda scored very well in my hands-on malware blocking test. When I opened a folder containing my current malware sample collection, it didn't do anything immediately. Panda waits for a significant event, such as file modification or creation; it doesn't scan just because a process accessed the file. When I copied the collection to another folder, Panda wiped out 86 percent of the samples.

It also caught some of the remaining samples when I launched them. Overall, Panda detected 89 percent of the samples and earned 8.8 points, the same as Kaspersky. Among products tested with this same collection, Trend Micro has the best scores, with 93 percent detection and 9.1 points.

Results from tests with my previous malware collection aren't directly comparable, of course, but you have to appreciate what Webroot SecureAnywhere Antivirus did with that bunch: It detected 100 percent of the samples and earned a perfect 10 points.

On my malicious URL blocking test, Panda's stats stayed remarkably consistent. It blocked about half of the URLs by preventing all access by the browser, and it wiped out about half of the remaining samples during the download process, often before I had even clicked Save. With 73 percent

protection, it's tied with Webroot. Trend Micro holds the top score, with 88 percent protection, and McAfee AntiVirus Plus 2015 is close behind with 85 percent.

The same toolbar-based mechanism that fends off malware-hosting URLs also serves to steer users away from fraudulent websites, phishing sites that attempt to steal login credentials. In my test, Panda blocked about half of the URLs, but in this context that's not so great. Panda's detection rate lagged 55 percentage points behind Norton Security's, which is a bit disappointing given that it was only 19 points behind last time. Internet Explorer and Chrome beat Panda by 20 and 41 percentage points respectively, though Panda did manage better detection than Firefox. The lesson is clear: Don't turn off your browser's phishing protection.

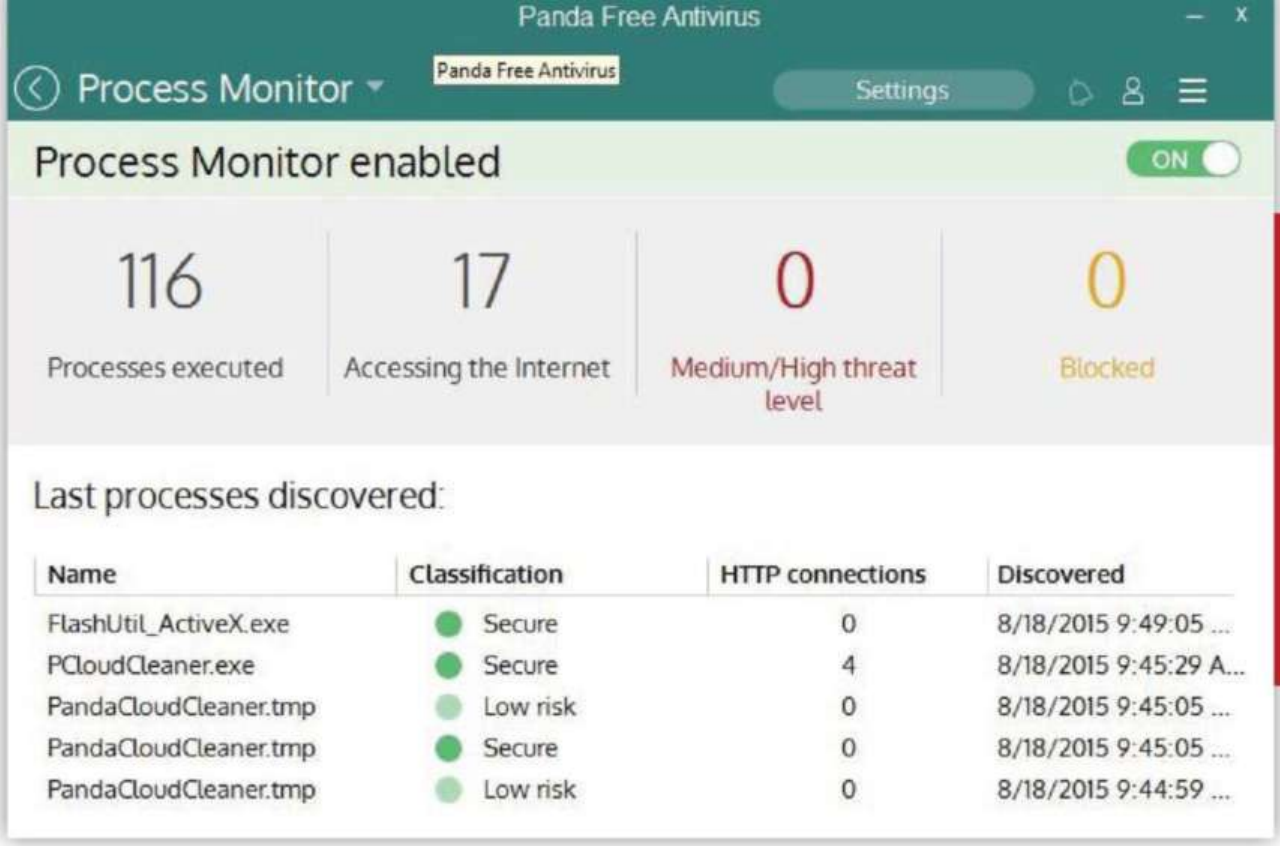
Panda packs an impressive number of effective features into Free Antivirus.

BONUS FEATURES

Panda packs an impressive number of effective features into Free Antivirus. You need the security toolbar, but if you want to get rid of other toolbars, ones that you may not have requested, you can launch the Toolbar Cleaner. In addition to removing toolbars and plug-ins from your browsers, this third-party utility can clear browsing traces and disable programs that launch at startup. Take care, though—changes you make using this tool are not reversible.

The toolbar includes a button to clear browsing data. This will come in handy for those who don't know that Shift+Ctrl+Del performs this function in most modern browsers. You can launch Panda's ActiveScan, an ActiveX-based online scanner that performs a search-and-destroy mission on active malware. A surprising note: ActiveScan is incompatible with Windows 8.

Back in the main application, there are options to deal with persistent malware. If ransomware or other malware has rendered your computer unusable, you can create a bootable Rescue Kit from a clean computer. There's also link to install and run Panda Cloud Cleaner,



PROCESS MONITOR
Panda's Process Monitor tracks all running processes to give you a clearer picture of what's happening on your PC.

which looks for malware and suspicious policies, and cleans browsing traces.

All these different scanners may make your head spin. Really, though, you just need to run Panda Free Antivirus itself. You can launch the alternate scans if you want a second opinion. Note that Cloud Cleaner and ActiveScan are available as free, standalone products direct from Panda.

By default, Panda scans every USB drive you insert to make sure it's not carrying malware, but you can kick protection up a notch using USB Vaccination. Effectively, vaccinating a USB drive makes it impossible for any other process to automatically launch when the drive is mounted. You can even set Panda to automatically vaccinate every USB drive you insert.

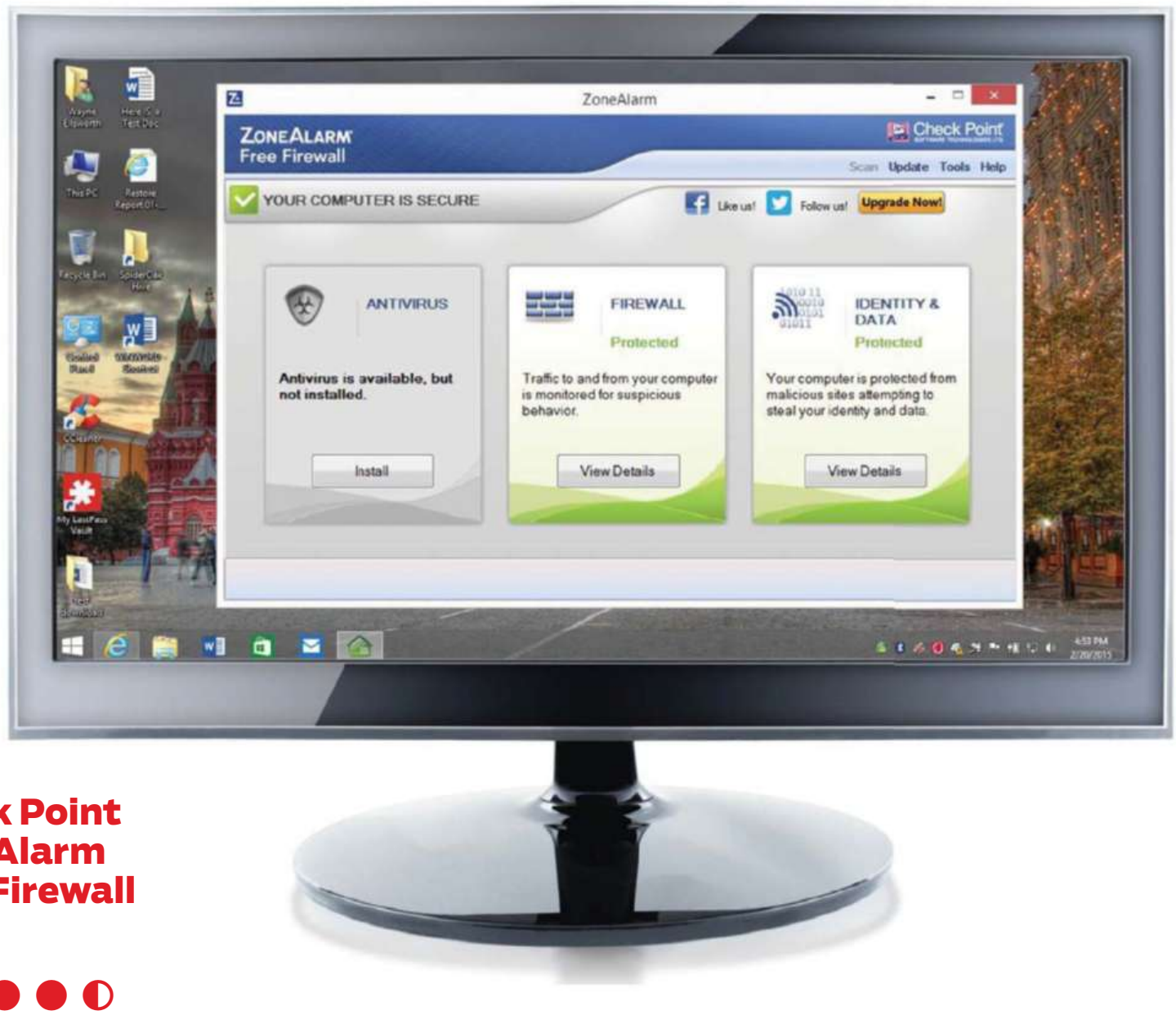
But wait, there's more! Panda's Process Monitor keeps track of all running processes and the URLs they access. It lists all active processes, along with their risk level and whether they're accessing the Internet. Naturally you'll pay special attention to any marked with a medium or high risk level. Panda itself will block certain processes, based on their behavior.

STILL A WINNER

In my own hands-on testing, Panda Free Antivirus tied with rockstar Kaspersky in malware blocking, and it beat Kaspersky in the malicious URL blocking test. Its phishing protection didn't shine, but antiphishing isn't this tool's primary mission. That's not too bad for a free product.

You can get even better protection if you're willing to pay for it. But Panda outperforms all but the best of its commercial competition, earning our Editors' Choice award for free antivirus software.

NEIL J. RUBENKING



Check Point ZoneAlarm Free Firewall

Free

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Reinforce Windows' Built-in Firewall With ZoneAlarm

PC MAGAZINE EDITORS' CHOICE

It's true that Windows comes with a built-in firewall, one that's particularly effective in the latest OS versions. But there's definitely still room for competition, especially when the competing firewall is free. The 2016 edition of ZoneAlarm Free Firewall isn't much different from its predecessor, but it still offers a few welcome changes.

HARDY FIREWALL

The product's main window hasn't changed. Three big panels represent Antivirus, Firewall, and Identity & Data. The Antivirus panel is grayed out, displaying the message "Antivirus is available, but not installed." The assumption here is that you're using ZoneAlarm alongside your favorite

antivirus product; if you're not, clicking a button will install ZoneAlarm's.

This year's edition eliminates the previous requirement to change your search provider and home page, a change that many will find welcome. Phishing protection is gone, as it was part of the toolbar, but antiphishing is not a typical feature for a firewall.

As one of the very first personal firewall products, ZoneAlarm has had years to evolve and mature. It handles the task of putting all your system's ports in stealth mode with ease, thereby making them invisible from the outside. Given that Windows Firewall can manage that feat, any third-party firewall that can't is suspect. (The designers behind the firewall in Kaspersky Internet Security actively chose to skip stealthing ports, focusing instead on detecting and blocking network-based attacks.)

Network attacks trying to exploit system vulnerabilities is one area the free ZoneAlarm doesn't attempt to detect. That level of intrusion prevention isn't typically found in free products. In testing, Kaspersky's firewall detected many exploit attacks, and Symantec Norton Security identified and actively blocked all of them.

ZoneAlarm's application control configures network and Internet permissions for all programs that attempt a connection. By default, it screens programs at the medium level, meaning it attempts a balance between good security and fewer pop-up alerts. It also uses Check Point's immense DefenseNet database to automatically configure permissions for a vast number of known good programs. At the Medium level, my handwritten browser was detected, but it automatically received permission to make outbound connections. At maximum, it detected the access attempt and asked me whether to allow it. Given the huge number of known programs this firewall handles automatically, I'd suggest you use the maximum sensitivity level and pay attention to any pop-ups.

Check Point ZoneAlarm Free Firewall

PROS Stealths all ports. Manages programs' access to Internet, network. No longer forces toolbar, homepage changes. Resists attack. Includes identity protection, online backup.

CONS No longer includes antiphishing. Iffy behavioral detection of programs.

Of course, the firewall can only control network access attempts that it detects. Leak test programs exercise sneaky techniques that malware sometimes uses, trying to manipulate or masquerade as a trusted program. ZoneAlarm detected most of the leak tests I tried, even actively identifying one as a malicious program.

As for standing firm against direct attack by malware, ZoneAlarm was one of the first to actively resist such attacks. I couldn't find any way that a malware coder could disable the firewall's protection. One trick that often works involves disabling startup of the firewall's essential services. With ZoneAlarm, I just got "Access Denied."

LEAK TEST: CAUGHT
Crank its sensitivity to maximum and Check Point ZoneAlarm Free Firewall can catch almost any leak test programs.

OSFIREWALL

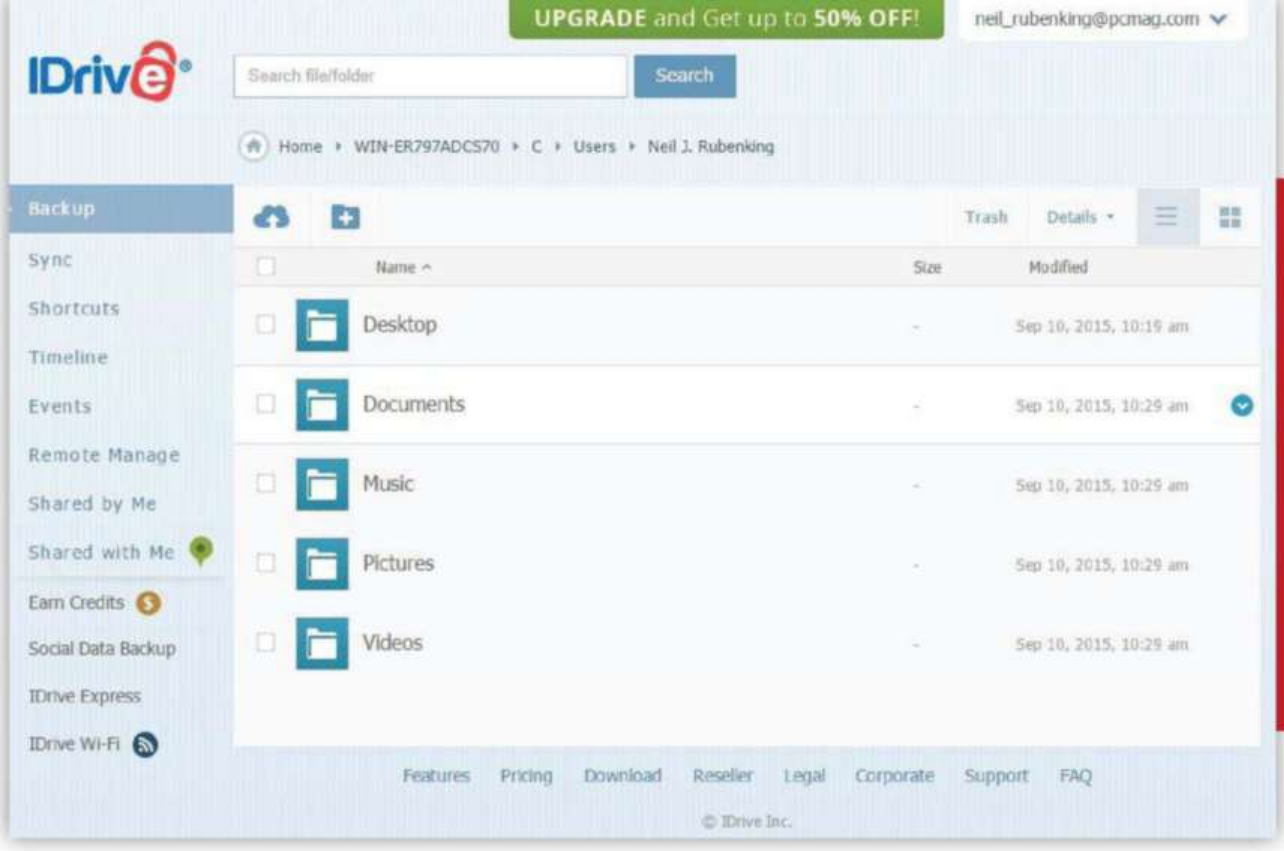
When I cranked the program control sensitivity to maximum, I noticed that in addition to network access warnings, I also got warnings about various suspicious behaviors. These come from the behavior-based OSFirewall feature.

At the default medium sensitivity level, I didn't get any warnings when I installed my usual collection of 20 *PC Magazine* utilities. After I raised sensitivity to maximum, every single utility triggered at least one warning, most during the installation process. ZoneAlarm reported the common behavior of creating and launching a temporary copy of the installer as "trying to…gain access to privileges resources." Many of the utilities got zinged for "trying to communicate with [Windows Explorer] by opening its process."

Naturally if I clicked Deny for any of these, the installation failed, or the program didn't run correctly. I still maintain that the maximum sensitivity level is best, but you might want to turn it down while you're actively installing new programs.

ONLINE BACKUP

Your ZoneAlarm installation comes with a free 5GB of online backup, powered by ZoneAlarm partner IDrive. IDrive's premium edition (which costs $59.50 per year) offers 1TB of storage, and is a *PC Magazine* Editors' Choice winner for online backup.



BACKUPS ONLINE
You can log in to your backups to remotely view and manage them, flip through previous versions, and securely share them with others.

As part of activating the backup system, you'll create an online account. Enter your name, email address, and a password, and you're good to go. Next, you must choose whether to let IDrive use a default encryption key, or specify your own private key. If you go the latter route, you absolutely must remember that key, as nobody can recover your files without it. On the plus side, even if a judge insists, IDrive can't turn over your files. Immediately after the installation finishes, it starts backing up files from important folders: Desktop, Music, Pictures, Videos, and Documents. You can easily tweak the backup set to add other folders and files.

The backup tool optionally lets you maintain a copy of your backed-up files on a local drive, or on a server. You can choose a full-drive image backup, though that's not likely to fit in the free 5GB of storage. From any Internet-equipped computer, you can log in to your account to view and manage your backed-up files. There's even a photo viewer. Mobile support and Social Data backup are among the many other features this impressive backup tool offers.

IDENTITY PROTECTION

ZoneAlarm's identity protection consists of two components. The Identity Protection Service monitors your credit and warns of changes, and Identity Lock protects against unauthorized transmission of user-defined personal data from your system.

The monitoring service is provided by ZoneAlarm partner Identity Guard. Specifically, you get one year of what they call Good Start protection. Once you enter your personal details, the service checks every day for new credit bureau inquiries, and alerts you via email of any changes to your credit file. If you're confused by an alert or have any other questions, unlimited toll-free support is

available. Note that although the service is free, you do have to provide a credit card as part of the verification process.

Identity Lock comes disabled, because it can't do anything until you enter the personal data you want protected. You can choose from more than a dozen categories, among them phone numbers, credit cards, and address info. For each item, you enter a descriptive name, along with the data to be protected. By default, ZoneAlarm uses one-way encryption to store the data, so even if someone got access to the program they couldn't read your private data.

At the medium protection level, ZoneAlarm alerts you when it detects private data about to leave your PC via email or the Web. If you choose to deny transmission, it replaces your data with asterisks. Crank it up to high and it replaces the data without asking. Do note that Identity Lock can't filter secure (HTTPS) connections.

“It's certainly a tough market for any product that isn't free, which, luckily, Check Point ZoneAlarm Free Firewall is.”

THE FEW, THE PROUD

There isn't a big market for standalone personal firewall utilities these days. With the growing power of Windows's built-in firewall, many have fallen by the wayside. It's certainly a tough market for any product that isn't free, which, luckily, Check Point ZoneAlarm Free Firewall is.

So it and Comodo Firewall 8 are our Editors' Choice winners for Windows firewalls. Comodo adds a boatload of bonus features, including a sometimes-problematic behavior blocker. ZoneAlarm sticks closer to the necessary features of a firewall, though it has its own bonuses. If you want a separate personal firewall, rather than one integrated into a security suite, either one is well worth a try.

NEIL J. RUBENKING

Features

INSPECTING APPLE'S FALL CROP

THE BRAVE NEW WORLD OF DIGITAL ASSISTANTS

THE ULTIMATE AUDIO GUIDE

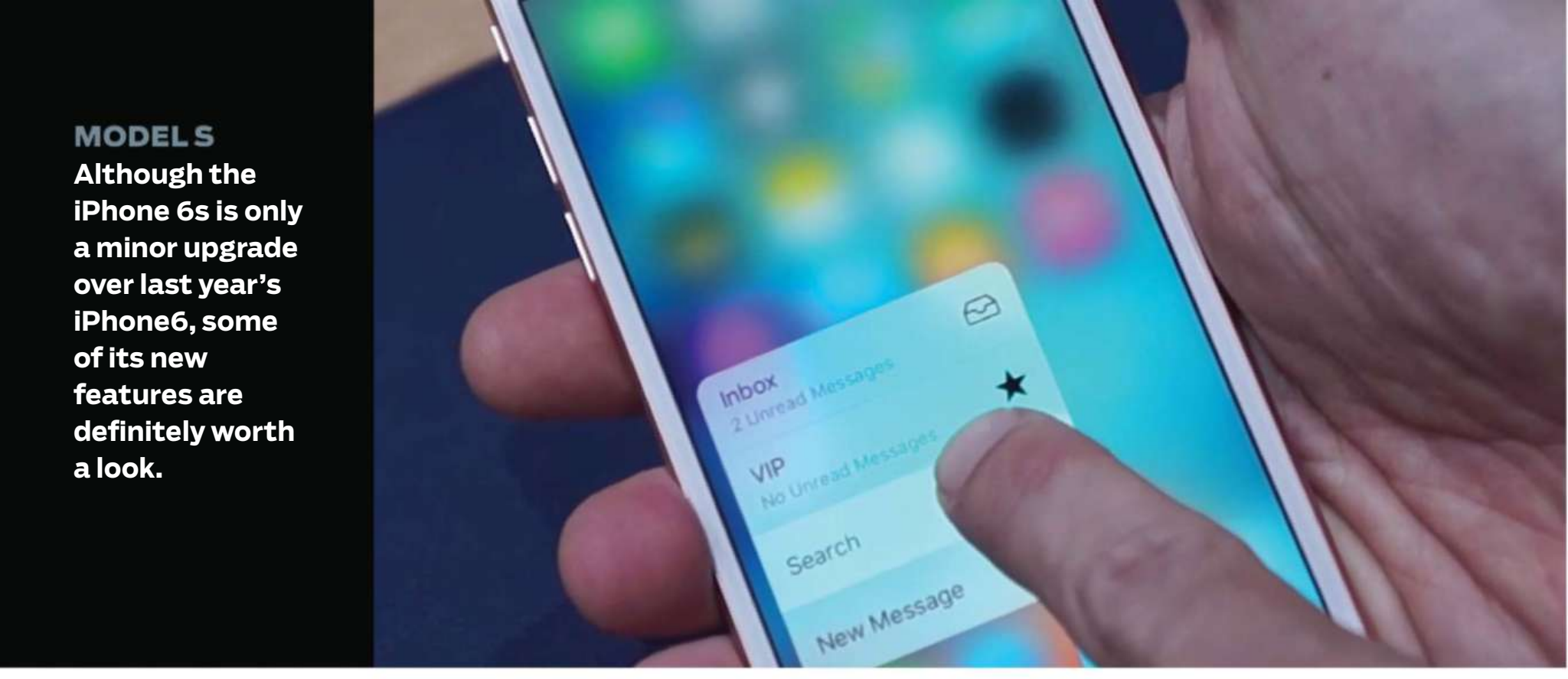
INSPECTING APPLE'S FALL CROP

BY SASCHA SEGAN AND DAN COSTA

At its annual launch event in San Francisco in September, Apple revealed some of the new hardware it's been working on: the iPhone 6s and 6s Plus, the extra-large iPad Pro and the pint-size iPad mini 4, and a totally revamped Apple TV, along with an upgraded version of WatchOS for its Apple Watch wearable. *PC Magazine* went hands-on with all of these—here's our report.

iPHONE 6s AND 6s PLUS

The "S" year is always a tricky one for Apple. The company has to show that a phone that looks exactly like last year's model is new, revolutionary, different, and the best ever. And from the outside, the iPhone 6s and 6s Plus do look exactly like last year's units, unless you choose the pink "rose gold" color.



MODEL S
Although the iPhone 6s is only a minor upgrade over last year's iPhone6, some of its new features are definitely worth a look.

But hold down on the screen a little too long and you'll notice the difference. This isn't the first phone with Force Touch (or "3D Touch," as Apple calls it here), but, as is usual with Apple, it's the first phone where the feature was properly thought through. It's right-clicking! For decades now, we have all understood that when we right-click on something, we'll get a contextual menu. iPhones have them now, too. The little contextual menus I found attached to Mail, Maps, Facebook, and Instagram on the iPhone 6s' home screen were all smart, consisting of features I actually would want to jump to. And just tapping on the screen doesn't prompt a Force Click. Digging into apps, I found the "peek" and "pop" features to be a little less intuitive than the contextual menus, if only because I wasn't always sure which apps supported them.

The other big changes I saw were in the cameras. The rear camera is now 12 megapixels—the existing 8MP camera was already fantastic, so I'll need to take a closer look to tell the difference. I really liked the front-facing "selfie flash," though, which flashes the screen a brief, brilliant white to improve your 5MP, front-facing selfies in low light.

I'm a little more hesitant about the "Live Photos" feature, which attaches 3 seconds of video to each one of your photos. Apple implemented the idea well; I love how you see little bits of motion as you flip through the gallery. But the 3-second videos mean you'll have to change your photography habits—holding a camera still for a little while longer—and although they'll play on Apple devices, it doesn't look as if Live Photos will work with other platforms or services like Google Photos or Facebook. HTC built the same feature in 2013, calling it "Zoe," and ran into enough interoperability problems that it never took off. Of course, Apple's ecosystem is big enough that it might be able to make this happen all by itself. (Apple also says that Live Photos will be available on Facebook later this

> **Apple's brilliance has always been in taking new technologies and making them usable and intuitive.**

year. That means that more than a billion people, on every platform, will be seeing the videos iPhone 6s users create.)

I didn't get a chance to figure out how well the A9 processor works compared with the A8. Although Apple says it's 80 percent faster, that's something I'll have to check through benchmarks and webpage loads. It will almost certainly push the iPhone back to having the fastest processor in a smartphone, beyond the Galaxy S6.

The phone now defaults to recording 4K video, which looks and acts just like the old 1080p video did, except that it takes up a lot more storage. Perhaps that shows the A9 at work. Your 16GB iPhone will seem even tighter. Don't buy one; get the 64GB model.

For anyone who's keeping track, other manufacturers had these features first. In addition to HTC's Zoe, BlackBerry had Force Touch on the Storm in 2008, LG brought us the screen-flashing "selfie flash" in 2014, and 4K video has been around in a bunch of phones for a while. Just like the Diamond Rio played MP3s three years before the iPod.

Apple's brilliance has always been in taking new technologies and making them usable and intuitive. That's often through very subtle judgments, like making sure you don't accidentally force touch when you mean to tap. It can also be through better communication; HTC was never quite able to explain Zoe, and Apple has a better chance with Live Photos.

Should you buy the new iPhones? Well, not the 16GB model if you know what's good for you. There are two categories of people who should jump on the new units. If you really love photography, especially taking selfies, the new cameras are a no-brainer. Also, these are the first iPhones with T-Mobile's Band 12, which dramatically improves coverage in some parts of the country, so T-Mobile folks need to get on board.

iPAD PRO

"Wow, that's a big iPad." That's the first thing you think when you pick up the iPad Pro, which you probably shouldn't be carrying around. The Pro is certainly slim and light enough to carry. That isn't the problem. It's that the thing barely fits in the crook of my forearm.

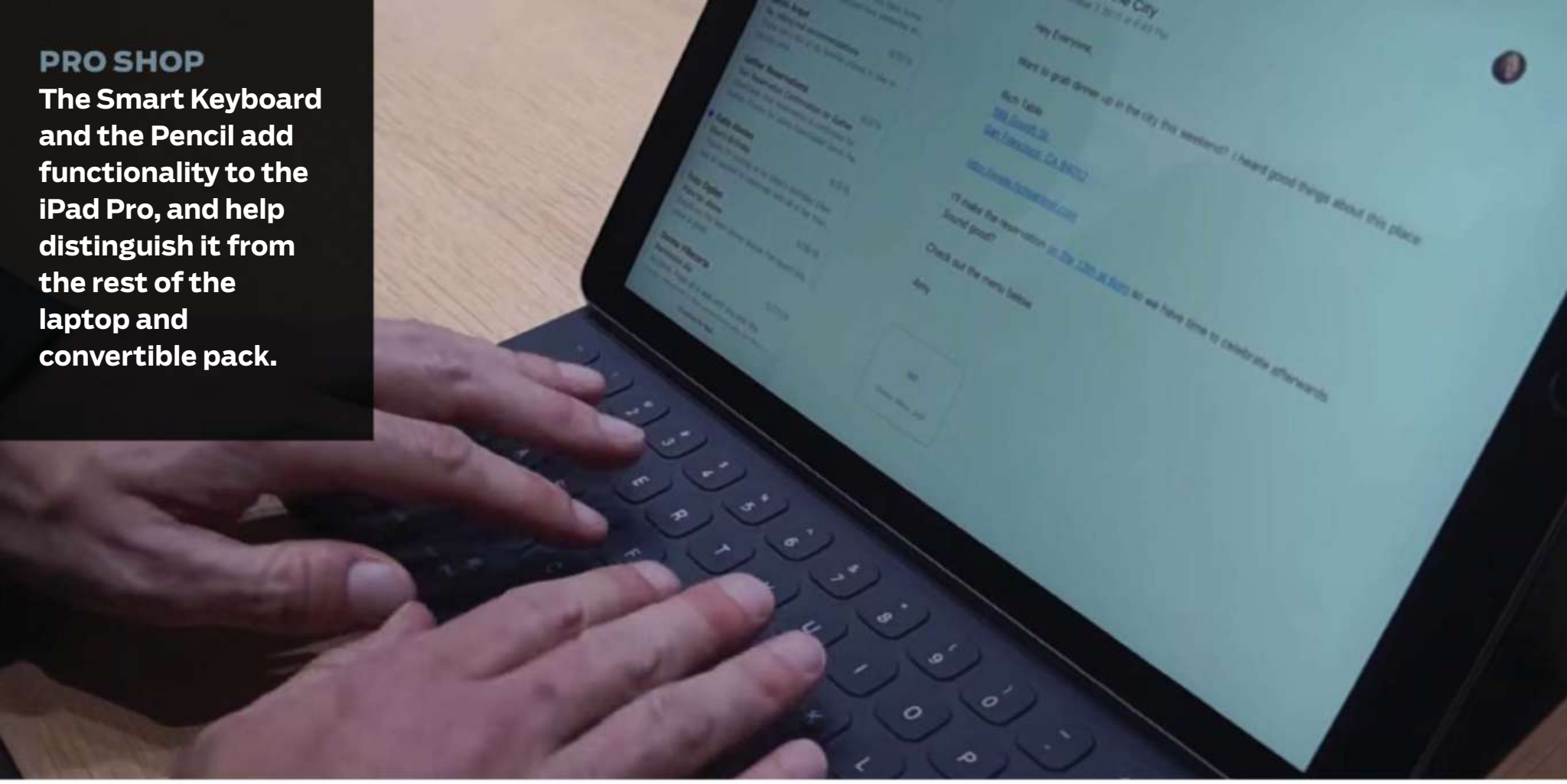
Here's another perspective: At 12 by 8.68 inches, the iPad Pro is larger than a closed 12-inch MacBook. Slap on the keyboard case, and we're probably working at about the same thickness and weight, too. And at $949 for the 128GB model, it's as pricey as a laptop.

Playing with the iPad Pro, though, I was struck by the things it does better than a laptop or other iPads. It will be up to Apple's developer community to build on that.

For one thing, the iPad Pro is an amazing drawing surface. I've used and reviewed various tablet styluses. None of them have the absolute accuracy that Apple's smooth, comfortable $99 Pencil does. Drawing on the tablet had zero lag and in fact felt superior to the Wacom Cintiq, which costs $799 just as a 13-inch display. And there are already amazing drawing apps on the iPad, including Procreate and an entire new Adobe suite. They run brilliantly on the new A9X processor. So there's that.

The Pro makes a terrific media tablet, thanks to its quad speakers. I first saw quad tablet speakers at IFA on Acer's Predator 8, and the Pro mainstreams them. Playing a movie really boomed, with the OS separating the speakers so bass came out of the bottom. Put this thing in a kickstand and it's a small TV.

It looks like a good thin client for work, too. Microsoft Office looks excellent; no distracting guff going on. Split-screen multitasking is just enough to make the iPad Pro experience feel like a powerful, if limited, laptop. As a screen for quick video editing, it excelled. Video editors could slap together 4K videos on the tablet and then bring it back to the office to use as a super-high-res secondary display for their main Macs when they need extra power.



PRO SHOP
The Smart Keyboard and the Pencil add functionality to the iPad Pro, and help distinguish it from the rest of the laptop and convertible pack.

Let's talk about that keyboard for a minute. The $169 device feels and folds a lot like the Surface Type Cover. The keys are big and well separated, at least. Apple made a big deal about its "dome switches," which give the keys a little travel, but they land hard. I typed on the keyboard for a little while and had good accuracy, but I couldn't fly quite as well as I do on my MacBook Pro because the keys lacked bounce. I know a lot of people have the same complaint about the new MacBooks.

Beyond that, though, well, the iPad Pro is definitely in an uncanny valley for tablets. It is not something you want to stand around using. It is not a small, cozy thing for your lap and the couch. It is not like curling up with a book. And yet, it doesn't run "real" multi-window desktop apps like the Surface Pro 3 does. I can see the iPad Pro, with its 2,732-by-2,048 screen, being a big deal for artists, architects, educators, and CAD designers. As for everyone else, I think the enterprise software needs to come before we can see this one flourish.

iPAD MINI 4

Oh, the poor little iPad mini 4! Apple's new small iPad got only a brief mention during the launch event, but it's an appealing little tablet.

Here's the deal: The mini 4 has a lot of the upgrades we were hoping for in the mini 3, to bring it close to par with the iPad Air 2. It really does look and feel like a shrunken-down Air 2. It's 6.1mm thick, just like the Air 2; it has the screen lamination and antireflective coating missing on the mini 2 and mini 3; and it has an A8 processor, which falls short of the A8X in the Air 2 but is

significantly faster than the previous minis. I'm also pretty sure Apple boosted the wireless.

I flipped around a mini 4 for a few minutes and it isn't exactly new or thrilling. If you've seen an Air 2, well, you're pretty much there already. But it does fill a $399 space in the lineup. It's on sale now.

APPLE TV

Don't call it a comeback. Apple TV has already been here for years.

And yet, here's Apple, launching an upgraded Apple TV with a new interface, remote, and plan to dominate your living room and grow its ever-expanding universe of technology and entertainment offerings. That new plan? Apps.

That would seem a bit flip, except for the fact that Apple made one of the most successful consumer-technology products of all time, the iPhone, by expertly leveraging third-party apps. Can Apple do it again? At the very least, the company has finally given current Apple TV users a reason to upgrade.

> **The company has finally given current Apple TV users a reason to upgrade.**

The Apple TV box itself looks pretty much the same. It's a little taller than the original and packs in more storage and processing power. The most notable hardware difference is the remote, which has gone years without an update. It now looks much more like a traditional remote with buttons for Menu, Home, Volume, Siri, and Play/Pause.

What makes it even more special is the touch sensor built into the top of the wand. Swipe your finger across the top and you can move through menu option icons. It's certainly responsive, but I couldn't really say it worked better than a traditional button. The remote's battery will last for three months and connects to the Apple TV via Bluetooth 4.0, so you don't need to point it at the Apple TV to make it work. The remote also comes loaded with motion sensors. Gaming is going to be a big part of the new set-top box, and the Apple TV

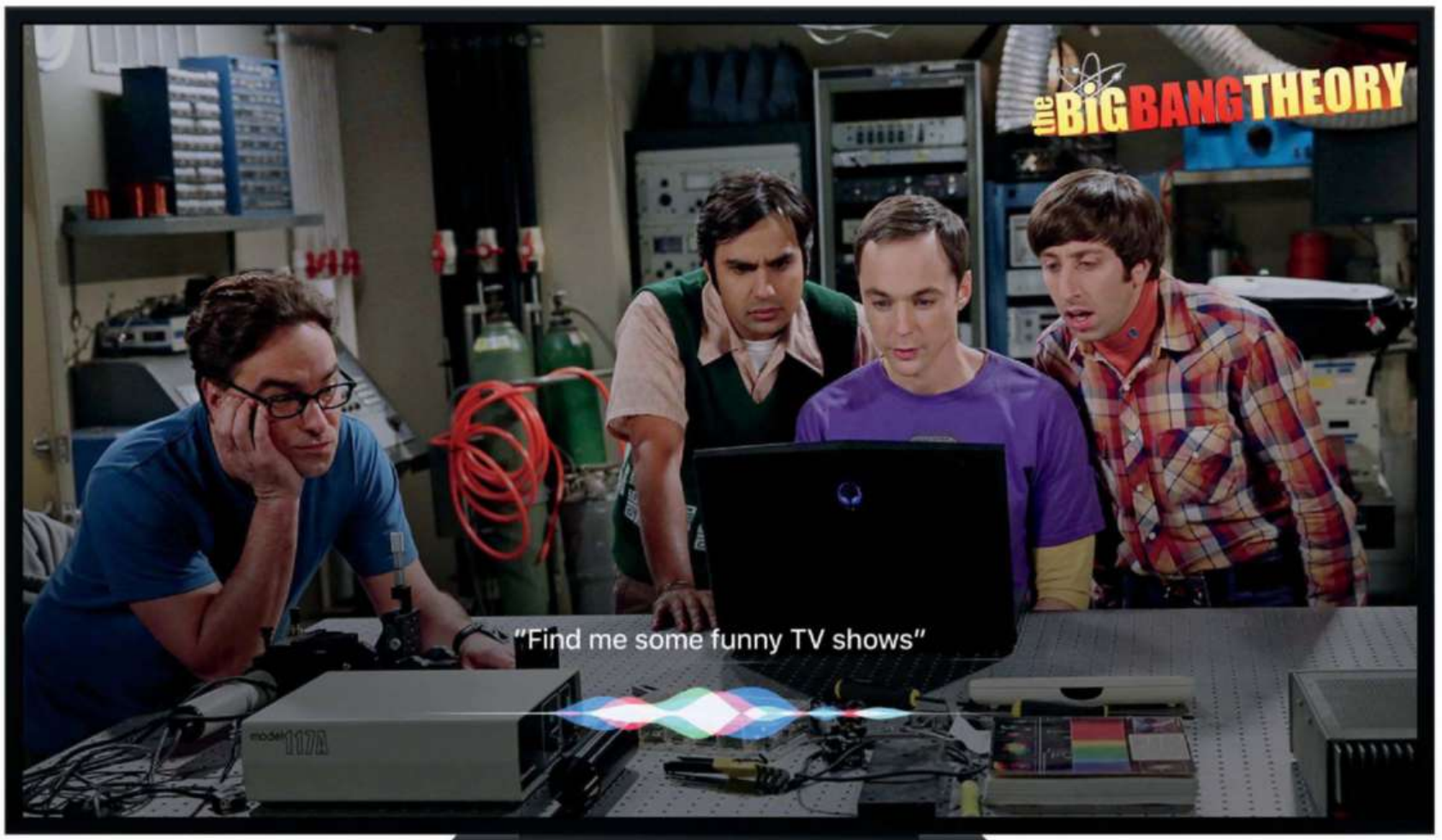
remote can be used a lot like a Wii remote. One of the demos I played had me swing the remote to bat virtual baseballs. It was a casual game, to be sure, but it could give the Wii a little competition.

The remote is well suited to the Apple TV's new interface, tvOS, which sadly will not be available to existing Apple TV owners. This update is definitely a step up, streamlining menus and accents Apple's existing content. It also provides more space for its media partners, like HBO, Showtime, ESPN, and MLB. Show descriptions now feature bigger art with more calls to action. Interestingly, tvOS will even tell you which apps or services are hosting a particular piece of content, so you can see if a show is on Netflix, Hulu, or HBO before you click.

The biggest integration is the incorporation of Beats 1 and Apple Music as the default music service. Like a lot of people, when I'm at home I stream most of my music through a soundbar connected to my TV. If Apple TV can make Apple Music the default music app for all of its users, that will be a big win for both products.

As a huge fan of Gilt, I had to see its app made specifically for the new Apple TV. This was the specific experience I found least satisfying. The pictures were bigger and the shopping process streamlined, but it just felt basic on the big screen. I suspect I will continue to shop more on my iPad than on my Apple TV.

Undoubtedly, the most significant addition to the new Apple TV is Siri. Apple's voice-activated assistant has been around for years, but you will find you ask her different things when you are sitting on your couch. Similar to the Amazon Fire TV remote, you can execute voice commands and have Siri search for content to watch. But not only can you ask to "see action movies," you can



specify that you want all the James Bond films or only those in which Sean Connery starred. Within seconds, the requested set of programming appears at the bottom of the screen.

You can also ask Siri to perform other tasks. When I asked "How are the Yankees doing?", she showed me their league standing in the lower third of the screen without stopping the video broadcast. You can also ask her to fast forward 5, 10, or any number of minutes, which worked well. I was also able to confirm that when you ask her "What did they say?" while watching a program, she will go back 15 seconds. Very cool stuff.

> **Apple TV has always seemed like a bit of an after-thought in Apple's super-profitable portfolio of products and services.**

Of course, this is still Siri. She isn't perfect, and it was pretty loud in the demo area. That said, I saw her struggle through some demos with less-than-perfect English speakers and still get their meaning.

Clearly, Siri isn't going to be restricted to your phone. The same way the Amazon Echo is executing voice-based commands in your home, Siri will soon be able to do the same. Although for now, you will need to press the button on the remote to turn on the microphone.

I will need more time with the product to determine if Apple has cracked the code to app-ify television. Notably absent at the event were the major broadcast TV channels. Apple has reportedly been trying to negotiate with broadcasters to deliver live TV over its devices, but for now you still need a cable box or an antenna to get it. Still, Apple has a decent set of launch partners: Netflix, Hulu, HBO, Showtime, MLB, and a massive catalog of its own on-demand content.

Apple TV always seemed like a bit of an afterthought in Apple's super-profitable portfolio of products and services, but there is a case to be made that it is just as successful as any other media-streaming device on the market. It certainly has more users than the Amazon Fire TV, although the Roku and Chromecast offer a lot of

the same functionality for less money. There are a lot more cord cutters out there now than there were in 2006 when the Apple TV originally launched.

Apple events are always filled with hyperbole, but even after a short demo, I can agree that this is the best Apple TV ever made. We'll soon find out if people will actually buy it.

The new and improved 32GB Apple TV will ship in October for $149, and a 64GB model will be available for $199. The previous Apple TV will still be out there selling for $69 through the holidays at least, so check twice before you buy one.

WATCHOS 2

I've been wearing an Apple Watch for a month now, and to tell the truth, I'm not sold. It's a good-looking device, but it's an expensive way to wear my notifications. The new watchOS 2 makes the watch even more fashionable, but it doesn't solve the utility question.

Let's start with the new watch

shows a time-lapse animation of one of six world locations, and a new gallery face that works with the iPhone 6s's "Live Photos" to animate photos when you raise your wrist. You can "time travel" on any face with a clock to see what your various complication modules would have said in the past, or what they might say in the future (like getting a weather forecast, for instance). It's all very smooth and very pretty, as you'd expect.

I saw a few third-party apps with

anyone can. The Maps app now has transit directions. Those are cool

things. Third parties can also introduce new complication modules into custom faces, but hold that thought for now.

None of them changes the game, though, and I think the current game is more embodied in the new Hermes leather wristbands than in anything the Apple Watch actually does. I can only understand the Watch as a fashion item. It's an elegant design statement that has some useful technology features, not a life-changing piece of technology that happens to have some style.

That might change as developers try the new native app and complication APIs in watchOS 2. I saw a modular face that had CNN headlines in it. Smartwatches have been able to do news headlines for a while, but the point was that any developer can now integrate its data into watch faces. Developers can also write apps that run natively and use the speaker and microphone. Could the Watch now become much more of a communication tool? Could it develop a following as an enterprise walkie-talkie, for instance?

Even more than Microsoft's, Apple's mobile business has always been about "developers, developers, developers." Opening up the iPhone to third parties with iOS 2.0 launched the iPhone into a completely new realm, and ensured its continued success. If the Watch is to make it past fashion to utility, the new developer APIs in watchOS 2 need to do the same. That's what could change Apple's game, and the smartwatch game in general.

IT TAKES TWO
The updated watchOS and Hermes leather wristbands are making the Apple Watch more functional and fashionable.

THE BRAVE NEW WORLD OF DIGITAL ASSISTANTS

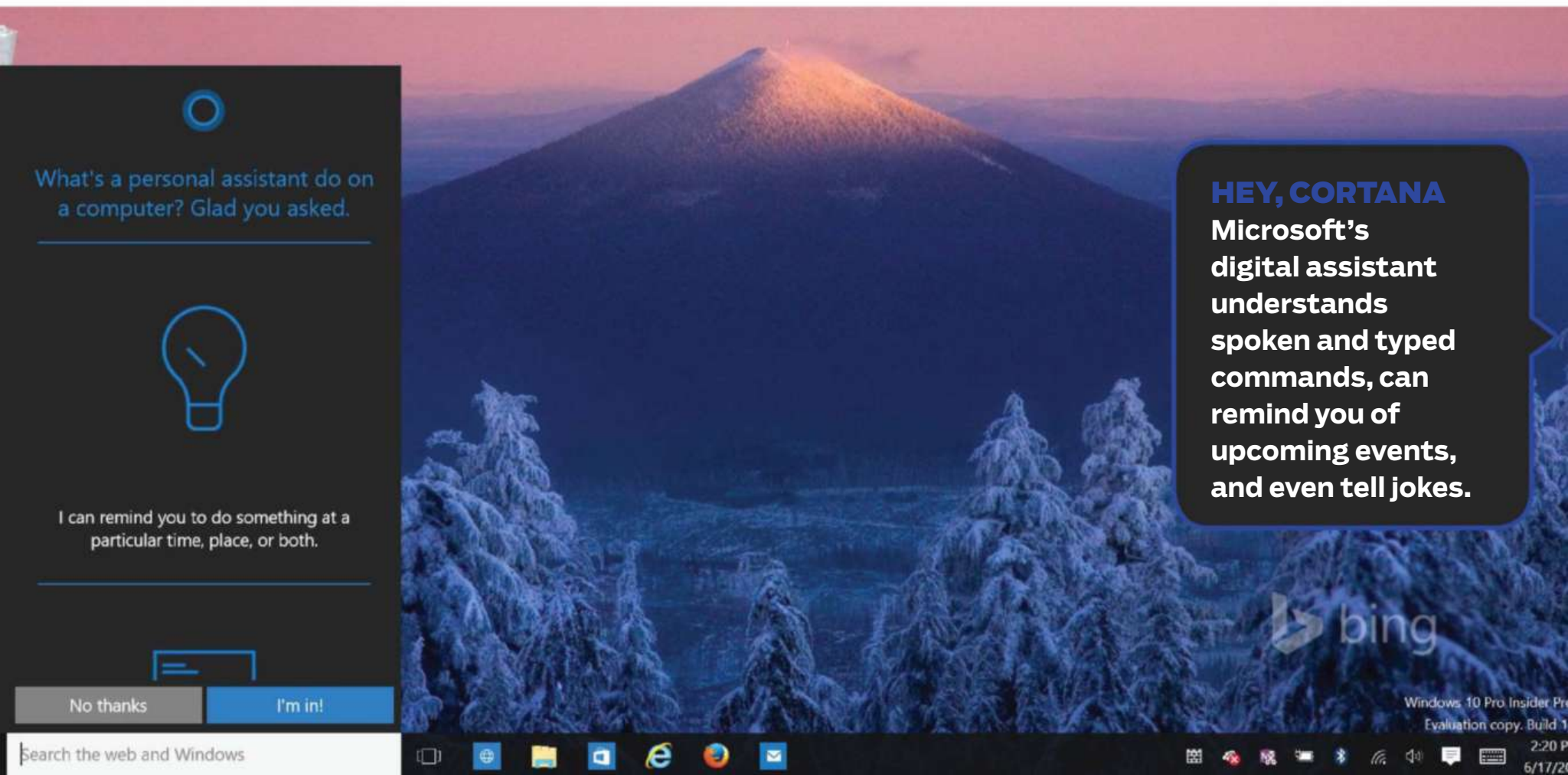
Digital assistants like Siri, Google Now, and Cortana are changing the way we interact with consumer electronics.

BY MICHAEL MUCHMORE

Most evenings when I get inside my living room door, I holler out "Xbox, On!" to start my evening's TV consumption. A coworker uses Amazon Echo to turn lights on and off in her house every night. In Windows 10, I now say things to my PC like, "Hey, Cortana, open Firefox!" These hands-free interactions can quickly become second nature—why would you want to hunt for a remote control, a switch, or an icon buried on the desktop when you can just tell your device what you want it to do? But this kind of convenience is now only opening ante for digital assistants like Apple's Siri, Google Now, Microsoft Cortana, Amazon Echo, and Facebook M. They now add intelligence to their voice responses to help you complete more and more complex tasks and provide answers to more kinds of queries.

Siri and other digital assistants have their roots in the U.S. military's Defense Advanced Research Projects Agency (DARPA)—also an impetus behind things like self-driving cars, GPS, drones, and even the Internet itself. The relevant project was called Cognitive Assistant that Learns and Organizes, or CALO, which was itself a part of DARPA's Personalized Assistant that Learns (PAL) program. That project could be considered the progenitor of all these digital assistants, unless you count HAL 9000, the talking computer from the 1968 movie *2001: A Space Odyssey*.

Spaceships aside, digital assistants are starting to show up in more and more types of devices. Since starting in smartphones, they've moved to other platforms, including the Web browser for Google Now, the PC (and eventually the Xbox One) for Cortana, a Bluetooth speaker for Amazon Echo with Alexa, and Facebook's Messenger platform for Facebook M.



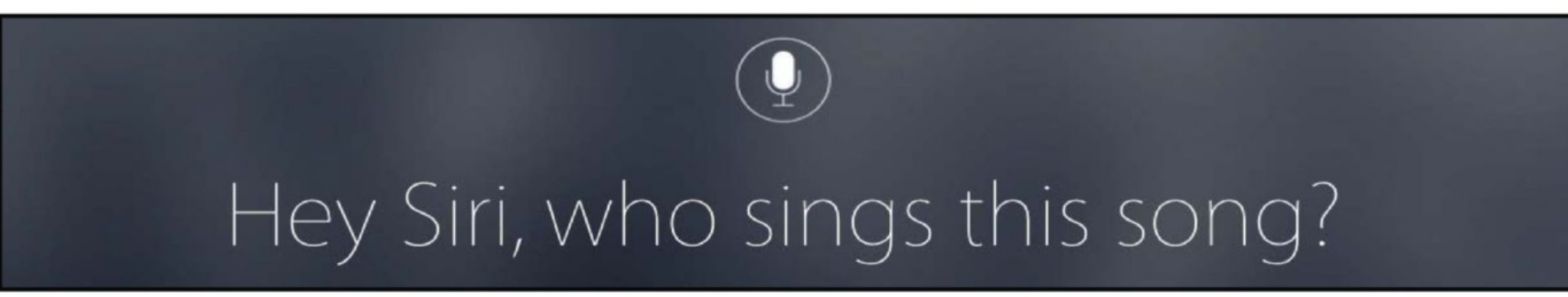
HEY, CORTANA
Microsoft's digital assistant understands spoken and typed commands, can remind you of upcoming events, and even tell jokes.

As all this suggests, even though they basically attack the same problems and share some of the same technologies, there are significant differences among the implementations of the five major digital assistants—and not only in what physical hardware they're found in. Some put more emphasis on bestowing a human-like personality to the assistant and others shy away from that approach. Some give you control over what the assistant knows about you and others less so. Some are proactive, others reactive. But they all have something to offer, and the potential to change how we live and work in major—and surprising—ways.

WHAT A DIGITAL ASSISTANT CAN DO FOR YOU

Basic voice command capability has been present on Macs and PCs for over a decade, but the technology made it into mass consciousness most strongly with Apple's introduction of Siri for the iPhone. That introduced new capabilities that went far beyond simply performing an action in response to a command from your voice and made digital assistants possible.

Now you can ask the assistant a question: "What was the Mets score today?", "When does the sun go down?", or "Will it rain today?" You can also ask for sports results and stock prices. In many cases, you'll get answers. But if the assistant doesn't understand context, it will simply return Web search results.



Subsequent advances in sophistication have led to digital assistants being able to perform more complex tasks like opening apps, composing and sending emails, booking a table at a restaurant, getting you directions, or buying movie tickets.

Opening apps, though, only goes so far. The latest assistants not only do this, but let you tell them what to do in the app. For example, you can say things like "Show me photos from last Christmas," "Skype Jimmy," or "Play music by Caribou." Google and Microsoft allow the third-party apps access to their assistants; Apple builds the capabilities into the OS itself.

Also new is that the assistants are actually starting to learn your habits and can even predict your needs or present relevant information. Warning you of bad weather, letting you know when to leave for the airport based on traffic, telling you

a package has shipped (which the assistant gleaned from your email), and informing you that a concert you'd like is appearing nearby—these are all things touted by Microsoft and Google as capabilities of their digital assistants.

In addition to auto-generated notifications, the assistants let you explicitly create reminder notifications and calendar events with your voice. One cool type of notification that all of the major assistants now offer uses geofencing, or location-based notifications. This makes it possible for you create a reminder to, for example, buy eggs when you're near a supermarket. Another type of reminder notification is contact-based. You could set a reminder to pop up reminding you to ask about her recent date when your sister calls or texts, for example.

ASK ALEXA
Alexa transforms the Amazon Echo from a simple connected speaker into something far more useful and special.

Home automation is the next phase for digital assistants. Google Now and Amazon Echo can already control connected home devices from vendors like Wink and SmartThings. These let you do things like turn lights on and off and lock or unlock your doors. And the assistants will be making their way into more devices, even cars—Apple's CarPlay will include Siri voice commands.

Another important data source for an artificial personal assistant is the health monitor. Fitbit now includes Cortana support in its Windows 10 app, letting you tell it about food consumption and exercise activity. In announcing the capability, Fitbit CEO James Park said, "With the new Windows 10 app, we ... give Windows users an even easier way to access, utilize, and interact with the information that matters most to them to further support them in their fitness journey."

You can also use a digital assistant for numerical problems. For example, you can ask it, "What's a 15 percent tip on an $85 dinner check?" The services also use search databases to fill you in when you ask questions like "What's the largest state?", "How many pints are in five gallons?", or "What time is it in Dubai?" Siri and Cortana get math capabilities and statistical data from WolframAlpha, and Google uses its own computation engines.

HOW THEY WORK

Digital assistants are all cloud-based—they mostly won't work without an Internet connection, though Siri in iOS 9 will and Cortana now makes use of local computing power where that's sufficient to get the task done. First, an assistant needs speech-to-text software like Dragon NaturallySpeaking has offered for years. This first piece of the digital assistant puzzle—identifying the words spoken—is anything but simple, when you consider the variety of accents and the multiple meanings of same-sounding words, such as "to," "too," and "two." Hence the need for massive computer processing power in the cloud.

OKAY, GOOGLE Google sees voice interaction with our devices as the natural next step for technology, bringing to them a new, natural communication.

Next comes natural language processing and AI, by which the system figures out what you're trying to do or learn. It does this by listening for preset keywords and phrases and by analyzing context. All of the digital assistants also use machine learning—that is, they hone their responses based on your trial-and-error attempts. Apple is very Iron Curtain about the inner workings of its technology, but a job posting for a Siri engineer on LinkedIn gave some insight: "We work on deriving core insights from collected data to suggest and create execute multivariate or a/b/c tests that drive fundamental improvements to user experience. On the other end, we work on core Machine Learning algorithms and tools that are part of Siri's ability to understand and respond to requests."

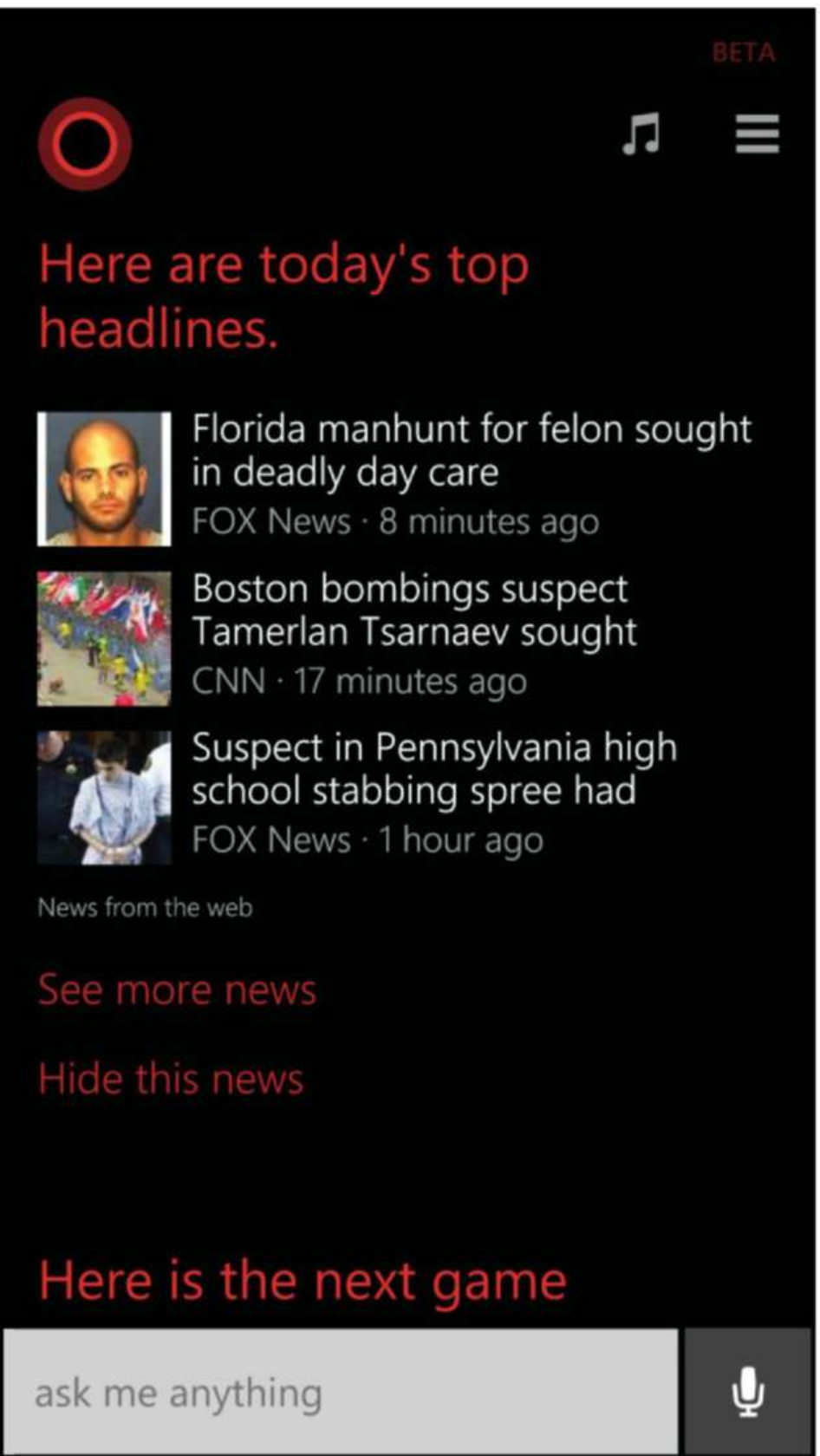
An advance on machine learning is "deep learning." This is the application of techniques such as neural networks (mimicking the brain's way of making connections) to massive amounts of data. It lets the systems actually learn from data thrown at them, rather than having to be programmed with preset answers. It's the same type of technology that allows automatic photo categorization like that recently introduced by Flickr. The technology is able to derive patterns from vast amounts of data thrown at it. Yahoo actually acquired two deep learning firms, IQ Engines and Lookflow, to make this happen.

Google acquired deep learning businesses DNNresearch and DeepMind Technologies, and deep learning teams at Google, one headed by famous scientist Ray Kurzweil, are also contributing to the search giant's language interpretation chops. According to the Google Research Blog, "Around 2012, Deep Neural Networks (DNNs) revolutionized the field of speech recognition." But the same post points out another difficulty: punctuation. This can be vital, as in the example given: You wouldn't want to render "I got the message you left me" as "I got the message. You left me." The company also recently filed for four machine-learning-related patents, which some fear could damage academic research in the field by hampering the free flow of ideas.

AND NOW THE NEWS

With practice (and your input), digital assistants can give you the information you want before you even ask for it.

Microsoft's Project Adam developed deep learning to help Cortana, among other things, determine a dog's breed. And its how-old.net age-guessing site that uses Azure APIs shows off machine learning, too.



But after the assistant determines what you've said, it has to take action. Of course there are preset phrases it can listen for, like "send an email," "open x app," or (in Cortana's case) "tell me a joke." But for less common queries, the assistant must dig into search engine data and return context-relevant answers. In some cases, the assistant listens for an app name and can open it; the Google and Microsoft assistants even let third-party developers handle these requests. But all assistants get stumped at times, and simply return Web search results based on the words you uttered.

WHAT THE FUTURE HOLDS

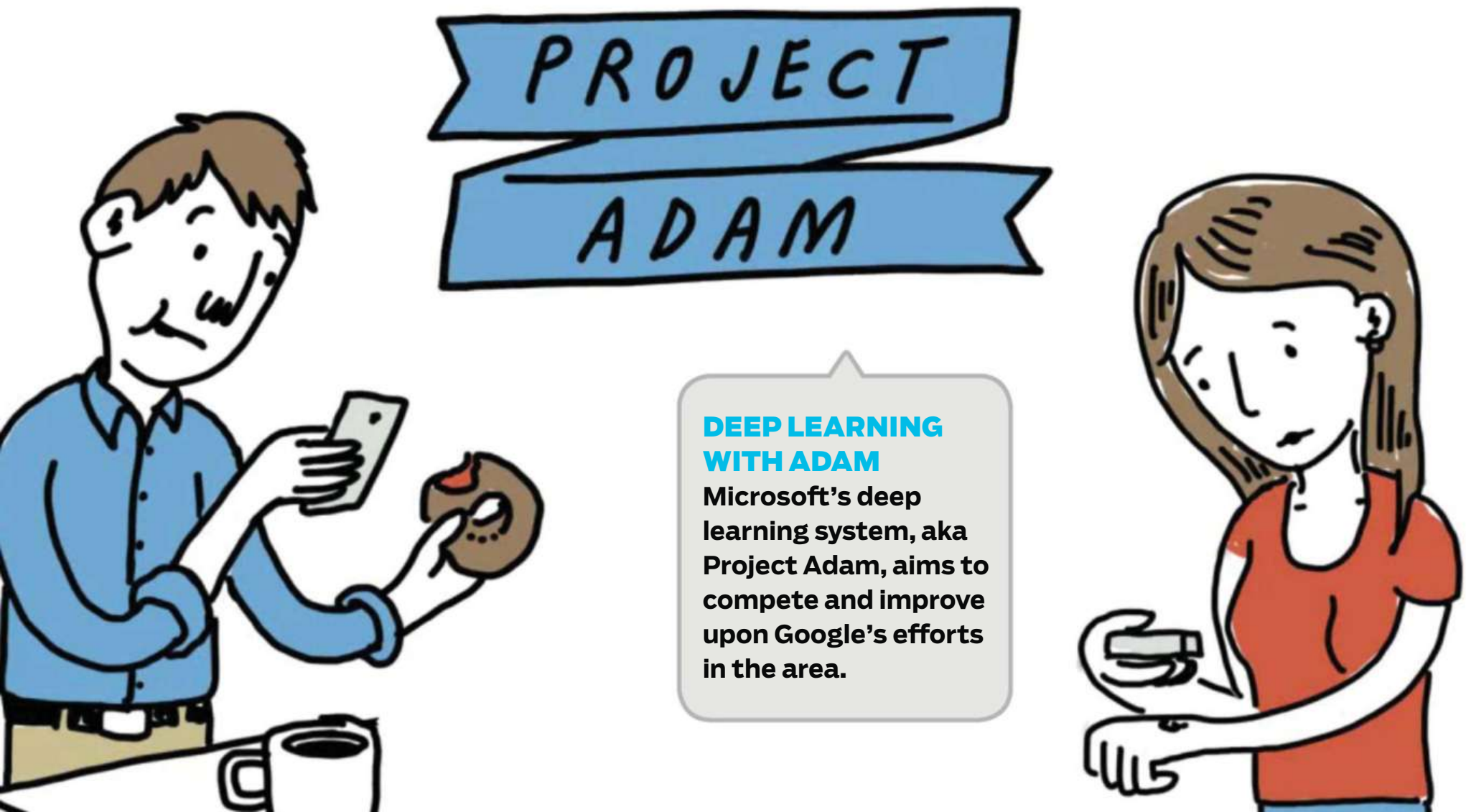
In the future, digital assistants will know you better and provide even more anticipation of your needs. And with advances in deep machine learning, their understanding of language will improve dramatically. Some of the technology isn't just coming from the four tech giants. For

example, Bright, another offshoot of SRI, is a project designed to use state-of-the-art sensors (gaze-tracking cameras, touch screens, gesture detection, and more) to anticipate your needs based on your habits—say, opening cat videos when you approach your computer with a cup of coffee, if that's what you always do. It could also enlarge app icons it predicts you'll need.

With the assistants tying in to more and more device types, the logical extension of all this is the "quantified self," which aims to monitor and record every possible piece of data about you, including calorie intake, activity, and sleep. It's actually a little bit scary in a Big Brother way. According to a July report from Tractica, "By 2020, [digital assistants] will penetrate more than 3.3 billion consumer devices including smartphones, tablets, smart watches, PCs, smart home devices, and automobiles, up from 821 million in 2014."

In discussing Project Adam in a post at the Next at Microsoft blog, Athima Chansanchai explained how the technology can extend beyond recognizing dog breeds. "With more data, you could take a picture of a meal and get its nutritional information," she wrote. "Or snap a photo of an unusual skin condition and get an accurate diagnosis. Or if you're out in the woods and need to know which plants are poisonous and which are edible, this is the technology that could help you do that."

More role-specific assistants will also appear. For example, GigJam is a Cortana offshoot that will let business users say things like "Get me the sales figures for last quarter of 2014."



DEEP LEARNING WITH ADAM
Microsoft's deep learning system, aka Project Adam, aims to compete and improve upon Google's efforts in the area.

OUR NEW FRIENDS ARE HERE TO STAY

As with most Internet-based tech conveniences, the companies that make digital assistants available are not simply giving you the services out of charity: They're getting something back: detailed info about you for marketing profiling. When you set up any of them, you're asked for your permission to allow them to scan your searching and email text and contacts.

Another caveat is that most of the services will respond to anyone's voice—not just yours—and they sometimes wake up when you don't expect them to. So if you're having a party, it may be a good idea to disable them. For smartphones with dedicated buttons to wake up the assistant that won't be a problem, but it could be for always-listening assistants.

Given the popularity of smartphones and the fact that all the major smartphone operating systems now include artificially intelligent, voice-responsive digital assistants, it's clear that these bit-based helpers are here to stay. And they'll appear in more and more places—speakers, cars, and PCs have already joined the fold. What's more, they continue to get smarter and smarter, with each software maker learning from the others and new language-parsing algorithms being devised. Will Siri, Cortana, or Alexa someday supplant the need for actual human assistance and companionship as we saw in Hollywood's *Her*? A lot more improbable things have happened.

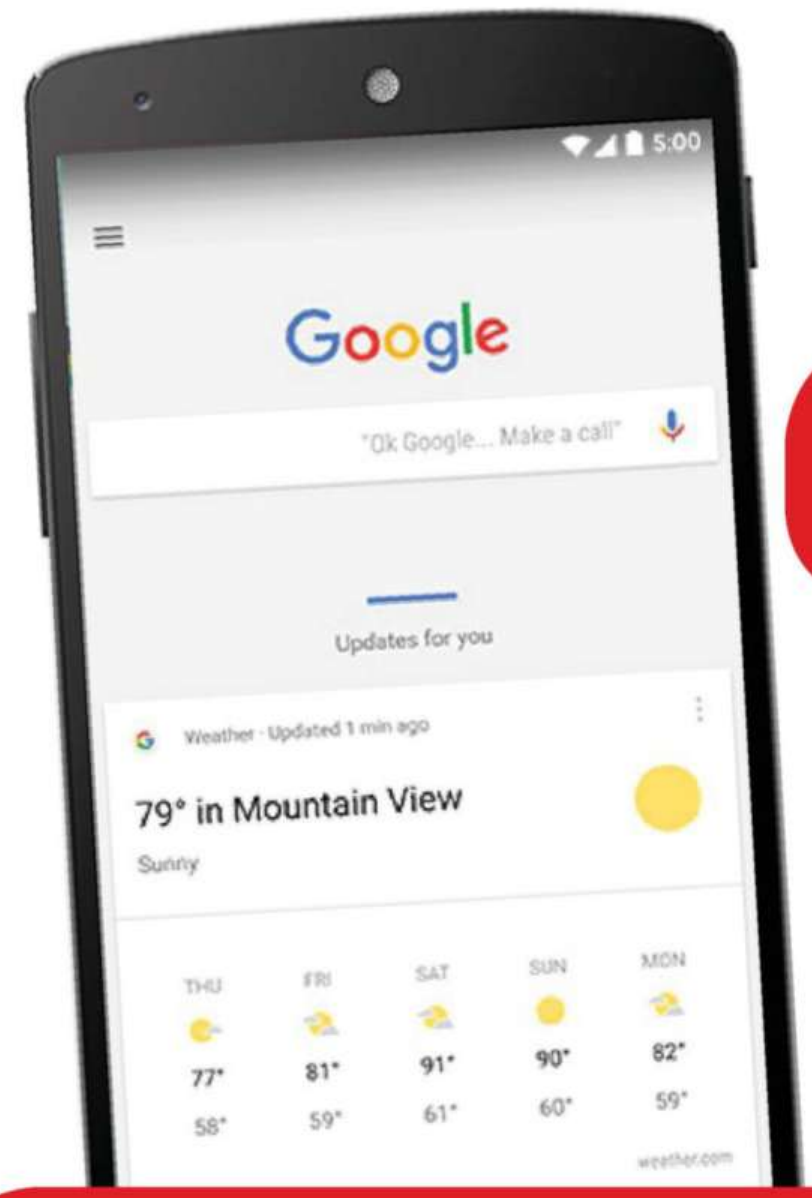
SIRI THE SEER

Apple's Siri popularized the concept of the digital assistant and got millions of users excited about the possibilities.

Siri started as a separate app from Siri Inc., founded by DARPA CALO veterans. Apple acquired the company in 2010 and included Siri for the first time in the 2011 iPhone 4S. Like all the assistants, Siri started out less intelligent than expected, but she has continually improved. Some would say she still too often returns Web results instead of doing what you want, but Siri is now capable of far more, including opening apps with specific requests, getting directions, and creating location-based reminders.

With iOS 9, Siri gets more proactive, à la Cortana and Google Now, both of which propose information they consider relevant to you at that moment. You can now search for photos based on your current location, for example. Siri works with many apps from Apple and third parties, such as a tie-in with Facebook's Find Friends feature that lets you locate and map your friends with one request.

Siri is available on iPhones and iPads, will be in CarPlay and the new Apple TV, and there are rumors that it will appear on Mac computers, too. You get a lot of voice choices for Siri, including both sexes and regional accents (such as Canada and India).



GOOGLE NOW

Google's digital assistant is really a couple of things working together: "Okay, Google" voice search and actions, along with the Google Now Cards. The assistant's claim to fame is that it was the first to predict your needs based on watching your email and searches. It's a purely impersonal assistant, unlike Cortana and Siri. You can't change the voice's gender, but you can choose among dozens of language localizations (such as Indian or Irish English).

When I tried voice search on a newly configured Samsung Galaxy S6, I got satisfactory answers for the current weather, calculating a tip, and nearby restaurants, holidays, and state capitals. But when I tried to create a reminder, I was informed that I had to enable Google Now. Doing so required allowing access to my searches and browsing activity, as well as device information including contacts and location. Google Now can deliver location-based reminders, but they're more limited in scope than, say, Cortana's. Through its Cards, Google Now boasts the most third-party integrations of any service, with Airbnb, Lyft, OpenTable, Spotify, TripAdvisor, Zipcar, and dozens more.

Google Now/Voice Search is available for Android and iOS (through the Google Search app), and on Windows and Mac PCs through the Chrome browser. Windows Phone users can get the Google Voice Search piece but not Google Now Cards through the Windows Phone Google app.

CORTANA

Named for an AI character in the Halo videogame series, Microsoft's digital assistant, which first appeared in Windows Phone 8 and now is included with Windows 10, was designed to combine Siri's personality with Google Now's predictive chops. But it's also unique in giving you control over what personal information you share with it using the Notebook innovation (which mimics how human personal assistants work). Cortana can open Microsoft or third-party apps and even control them (and let you do so with your voice) if they use its programming API.

You can have Cortana listen for the phrase "Hey, Cortana" to wake up and take your command or, unlike with Siri, type into Cortana's search box to find Web results as well as local files, apps, and settings. Cortana is also the only service with a real sense of humor, revealing a large (but spotty) repertoire when you ask her to tell you a joke.

In addition to the predictive notifications and voice answers, Cortana offers a Daily Glance of things like weather, sports results, and local news. It only offers one voice choice: the female voice of the video game character.

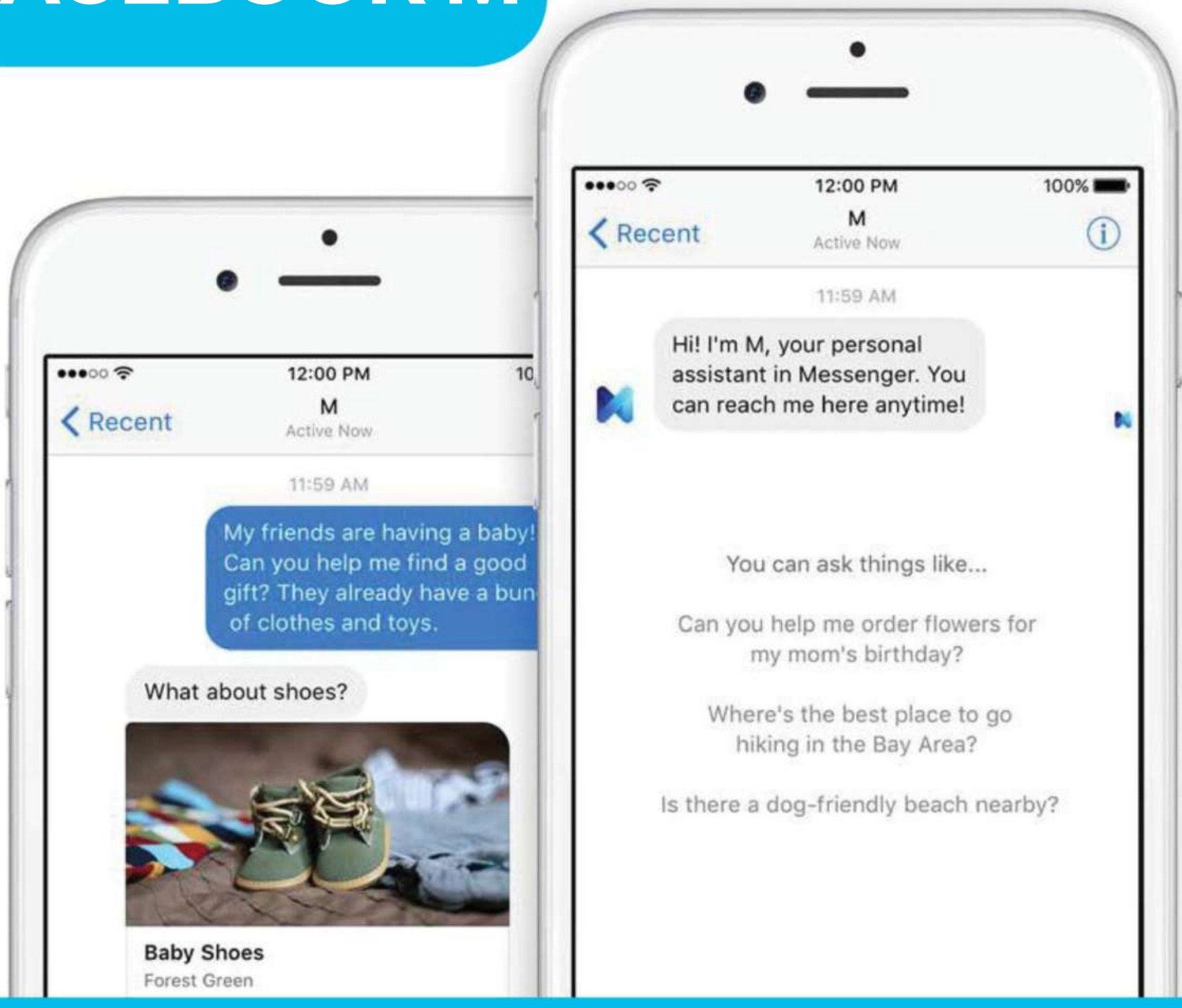
Cortana is powered by a few Microsoft technologies, including the Tellme natural language processing engine, massive cloud computing power in Azure, and Satori (the Bing search repository categorized by entities and actions). Cortana will serve not only Windows phones and PCs, but also Xboxes, and Microsoft has announced Cortana apps for both Android and iOS.

ALEXA
(AMAZON ECHO)

The Amazon Echo is a cylindrical speaker/mic device that includes voice commands by way of an assistant called Alexa. It's far more limited in its repertoire than Cortana, Google Now, and Siri. For example, it doesn't offer any proactive alerts, email, or messaging. Alexa's strong points, as you'd expect from a smart speaker, are music and audiobook playback, but it will also tell you the weather and news, set alarms, look up Wikipedia information, and even buy you products from Amazon. It also includes powerful mics that may be the best among the devices for accurately hearing what you say. Alexa can also tie in with home automation using "Hubs" for services like Philips' Hue and Belkin's WeMo.

In his *PC Magazine* review of the Echo, Alex Colon stated that "Alexa definitely isn't as smart Siri or Google Now, and she lacks access to services like your email and other messages, which makes her far less useful." You do, however, get Google Calendar support, and Alexa can seamlessly access your calendar to tell you your schedule—even if she can't add new appointments for you. (Emailing and setting reminders is a particular strength of Cortana, for what it's worth.)

FACEBOOK M



Facebook's digital assistant differs from the others in several important ways. First, it employs actual humans as well as artificial intelligence to get answers to the questions you ask. Or, as Facebook engineer David Marcus puts it, M is "trained and supervised by people." In truth, I expect a similar claim could be made for Siri, Cortana, and the rest. Nor is M voice-activated; instead, the assistant lives inside Facebook's Messenger service, which you can access either on the Facebook site, on messenger.com, or in apps for iOS, Android, and Windows Phone.

Though it was announced as a service to "complete tasks" Facebook M seems to be more about finding places to eat or products to purchase. Sample questions it can handle include "Can you help me order flowers for my mom's birthday?" and "Where can I get a great burger in Chicago?"

THE ULTIMATE AUDIO GUIDE

Don’t settle for subpar audio from your tech devices. These products, all *PC Magazine* Editors’ Choice award winners, will make your favorite music and movies sound better than ever.

BY *PC MAGAZINE* STAFF

KEF X300A

$799.99

For audiophiles with means, the KEF X300A offers outstanding sound when connected to a computer via USB, bypassing your system's internal sound chipset. There's no wireless Bluetooth or AirPlay support, although you can plug in an iPad, Android device, or other mobile gadget using the 3.5mm auxiliary input, and you can also connect the X300A to an Apple AirPort Express for wireless listening from AirPlay-compatible devices. It's as close to perfect a powered desktop speaker system as we've heard in this price range.

Edifier Exclaim E10

$99.99

There are few options for under-$100 PC speakers that deliver anything other than subpar audio quality, but Edifier has managed to make a sharp-looking, sharp-sounding system with the e10. It delivers clear mids and highs, subtle lows, and does so without distortion except on deep bass tracks at maximum volume. If you favor crisp highs and mids, and you're on a budget, Edifier's solid, interesting-looking speaker pair outperforms most in this price range.

Harman Kardon Aura

$399.95

The Harman Kardon Aura more closely resembles a work of art than a speaker, but it can do the job of both. Although it looks striking, with a clear, curved dome and subtle lighting, it's also a functional and powerful wireless speaker that supports Bluetooth, AirPlay, and DLNA playback, and puts out an impressive amount of power. It's strictly a stationary model, but you're getting room-shaking, full-bodied sound in trade for that portability. It excels as a one-piece sound system.

Sonos Play:1

$199

In a time where Wi-Fi–based and AirPlay speakers still generally command a pretty penny, Sonos offers the Play:1 for a reasonable price. The Play:1 is designed to be the basic building block of an entire Sonos multiroom system. It's small enough to fit on a shelf or table, but hefty enough to put out plenty of sound. Although it's neither portable (you need to plug it into a wall outlet) nor Bluetooth (you need to use Sonos' Wi-Fi-based standard), it sounds excellent for its price and size, and lets you set up your entire home for sound with ease.

Polk Audio Hampden

$399.95

From its unique, retro-futuristic design to its powerful audio performance, the Polk Audio Hampden stereo speaker system works hard to justify its high price. It streams Bluetooth audio, and can even receive a wired, digital stream via USB, bypassing the lackluster digital-to-analog converters most computers and mobile devices employ. These speakers can get ridiculously loud, and we encountered only minor distortion at maximum volume when playing tracks with deep bass.

Bang & Olufsen Beolit 15

$599

Sometimes luxury is worth paying for. If the Beolit 15's price doesn't cause you to look away in horror, this speaker will not disappoint. It's wonderfully designed, visually pleasing, and easy to operate, with useful ergonomic elements (such as compartment for storing the power cable). And its sound quality is fantastic, complete with rich lows and clear highs, though purists may not adore its sculpted sound.

Bose SoundLink Mini II

$199.95

The SoundLink Mini II improves upon its predecessor with improved battery life and speakerphone functionality, but retains the original's smart design, plentiful features, and big sound, complete with truly convincing bass. Portable Bluetooth speakers have a long way to go before audiophiles and purists hop onboard, but for those looking for a powerful, clean audio experience from a tiny speaker, the SoundLink Mini II is the way to go.

JBL Clip+

$49.95

JBL has done little to upgrade its original Clip Bluetooth speaker—aside from a splash-proof, washable design, the $49.95 Clip+ is very similar to its predecessor. But the Clip was already a winner, and being splash-proof can be a big deal for those who really want to take their music anywhere. For the price, it's hard to find a more outdoor-friendly, solid-sounding speaker than this one.

Definitive Technology W Studio

$1,299

Definitive Technology makes impressive speakers that tend to be relatively expensive, which explains the W Studio's sky-high price. But this soundbar–wireless subwoofer combination sounds wonderful and offers high-end features like HDMI switching and multiroom Wi-Fi audio with Play-Fi. It also looks stylish and is built rock-solid, making it one purchase that just might be worth the splurge.

Zvox SoundBase 570

$399.95

Speaker slabs can both add quality sound to an HDTV and act as a stand for the set. The Zvox SoundBase 570 speaker slab may not be quite as thin or invisible as some other models we've seen, but its sound quality more than makes up for it. The Soundbase 570 puts out excellent audio for movies and music without the need of a separate subwoofer, and sports built-in Bluetooth on top of the usual wired inputs. There are few betters way to get home-theater-size sound without actually setting up a home theater.

Sony MDR-1A

$299.99

Sony's latest addition to the MDR lineup is a thoughtfully designed, exceedingly comfortable headphone pair made with luxurious materials. No, it isn't cheap, and given the lack of Bluetooth or noise-canceling circuitry, that price could only be reasonable if the audio performance were exceptional. Thankfully, it is. The MDR-1A brings powerful bass and balances it with crisp high-mids. The boosted lows and sculpted higher frequencies won't be for everyone, but most listeners will love what they hear.

Skullcandy Method

$29.99

Skullcandy's earphones have typically veered toward the bass-heavy end of the spectrum, and the exercise-focused, in-ear Method is no exception. The moisture-resistant design will withstand sweaty workouts; and the intense low end will please bass lovers, while offering enough balance with its sculpted high-mids and highs. Despite lacking a flat response, the Method is a fantastic value for any bass lover on a budget.

Bowers & Wilkins P5 Wireless

$399.99

There's no shortage of $400 Bluetooth headphones, but the Bowers & Wilkins P5 Wireless may well sit at the very top of this populous mountain. The P5 Wireless earns its price in two ways: It's an exquisitely, thoughtfully designed product, and it delivers some of the best wireless audio we've heard—there aren't many Bluetooth headphone pairs that sound more balanced and full.

Jabra Move Wireless

$99

Thanks to the recent renaissance in Bluetooth headphones, an inexpensive pair like the Jabra Move Wireless can hang with many wired options in the same price range. The Move Wireless has a simple, classy design, and the plush earpads remain comfortable over long listening periods. The best part? Bass lovers who want their low frequencies balanced out with crisp highs will be pleased.

Kingston HyperX Cloud II Headset

$149.99

Most gaming headsets look sci-fi flashy, with brightly colored highlights, sharp lines, and glowing lights. Kingston went in a different direction with the HyperX Cloud II: Its boom mic is removable, so it can also be an attractive set of over-ear headphones. All this, plus its comfortable construction and compatibility with many computers, mobile devices, and game systems means it's just as good a regular headset as it is a gaming headset.

Skullcandy PLYR 1 Gaming Headset

$179.99

Combining wireless performance, simulated surround sound, and flexible connectivity into a single attractive package, the Skullcandy PLYR 1 Gaming Headset is a fine choice for gamers who also want to occasionally listen to music or watch video. An optical audio passthrough and charging base that doubles as a stand for the headset when it's not in use are handy additional features.

Bose QuietComfort 25

$299.95

The QuietComfort line is the original über-popular headphone family, and this latest model proves that it still earns its accolades. It's the go-to choice if you're looking for top-notch noise cancelation and don't mind a heavily sculpted sound signature to match. Another bonus: Unlike previous QuietComfort headphones, the 25 can be used in passive mode, for those times you don't absolutely need to block out the noise around you.

Bose QuietComfort 20 or 20i

$299.95

Noise-canceling in-canal earphones have been far less popular and common than noise-canceling on- and over-ear headphones, but Bose makes this design work, too. The QuietComfort 20 and 20i (the latter intended for use with iOS devices) costs the same as their on-the-ear brother, but offer by far the most advanced, flexible noise cancellation we've ever experienced in earphones—and, though not flat-response, the sound is full, with rich low end and crisp highs.

Jaybird X2

$179.95

Jaybird's audio gear has an exercise focus, and the recently released X2 Bluetooth earphones go above and beyond to ensure you get a secure fit. For the X2's high price you get plenty of fit accessories, but also solid audio performance, with deep bass response and clear highs. These earphones sound as good as plenty of non-exercise-focused models in this price range.

SOL Republic Relays Sport

$49.99

Don't think you can get good sound and a secure fit from earphones that cost less than $50? Think again—you do with the SOL Republic Relays Sport. It includes four pairs of differently sized silicone ear tips for all ear sizes, and nicely balances bass response and crisp, clear highs. You can even choose between a single- or three-button inline remote, so Relays Sport's level of personal convenience is customizable, too.

GET ORGANIZED

Don’t Let Tech Sabotage Your Productivity

EDUCATION

The Best Software for Learning Languages

CONNECTED TRAVELER

Traveling? Take Your Movies With You

GAMING

Retro Gaming That’s Still Got It

Digital Life

Don't Let Tech Sabotage Your Productivity

BY JILL DUFFY

I spend a lot of time reading research about organization and productivity, and I spend a lot of time hanging out with tech enthusiasts. As I've discovered theories and best practices about maximizing productivity and keeping organized, I've also noticed common habits among people who love technology that directly sabotage their ability to function at their best. Here are the five biggest—and what you can do to avoid them.

APP-HOPPING

If you love tech, you probably also love apps. You're always downloading the latest app. You're proud of being an early adopter. But you're sabotaging yourself if you app-hop with productivity apps. These are any apps and services that help you get work done, including to-do lists, task management apps, file syncing services, note-taking apps, calendars, and office suites.

With any new app, there's going to be a time investment for migration and learning how to use the system. Add in customization, and you're wasting a lot of time that you could spend being productive. Plus, it will take you a while to develop new habits for using these apps that you probably use daily. That's more lost time, and often more "work about work."

That said, you should get rid of any app or service that isn't meeting your needs. But that decision needs to be based on whether your existing tools do what you need, not whether you think the grass could be greener with another app.

FALLING INTO THE EMAIL BLACK HOLE

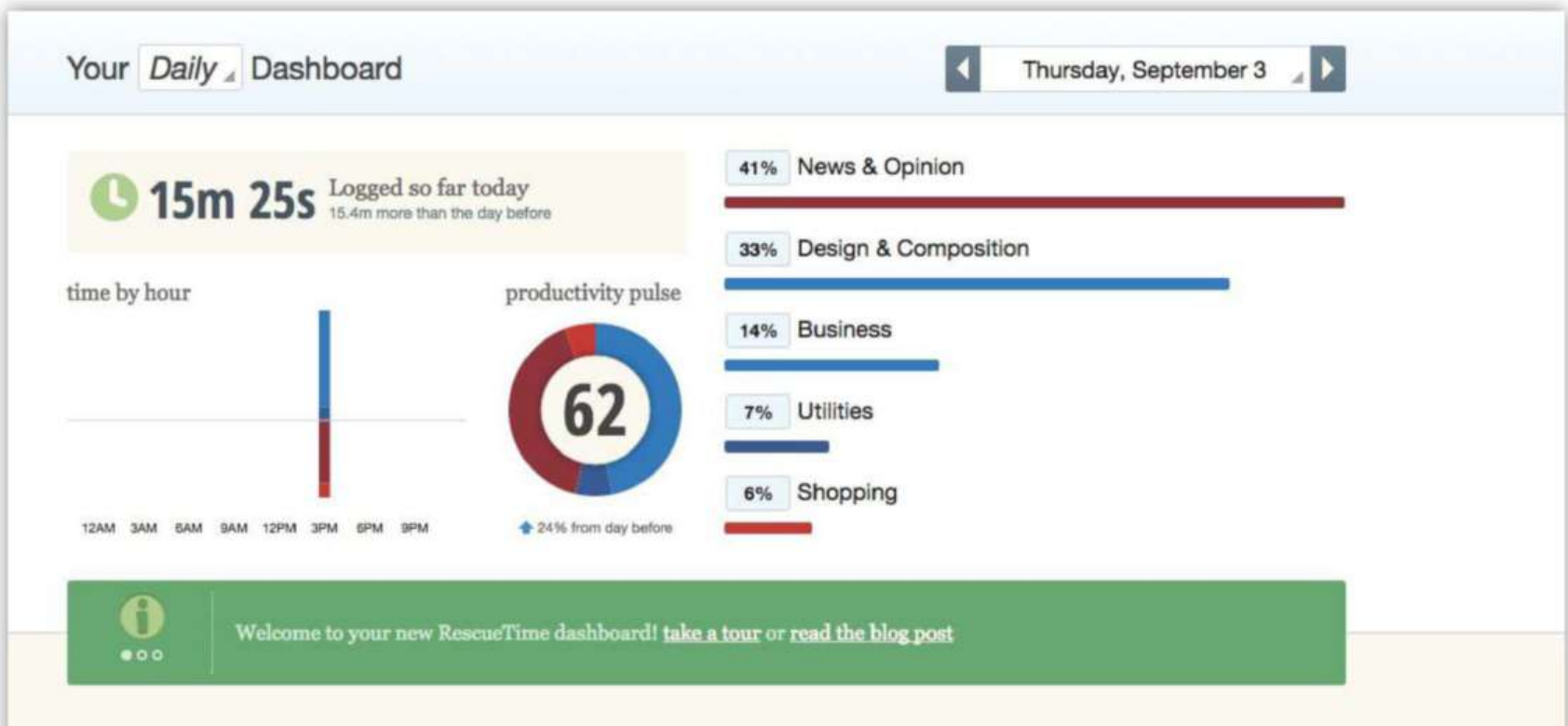
Most tech enthusiasts know they shouldn't waste too much time with email, and yet they get sucked into it for hours every day. Just how bad is your email problem? Do you even know how much time you're wasting?

One way to measure it is to use RescueTime, a freemium tool that works invisibly in the background to record how much time you spend in every app and website you use, including email.

RescueTime can open your eyes to the severity of your email problem, but it can't stop you from using it. The plug-in Stayfocusd can if you use Web-based email. Add your email website to the list of domains you'll be prevented from accessing, then set the times when the limitations should be enforced. StayFocusd will block you from the site.

Speaking of times, another way to curb an email problem is to create new habits for when you check email. Experts generally agree that one of the worst ways people sabotage their productivity is by opening email as soon as they get to their desks. It's better to start the day with a highly productive task and save email for later.

"But," you protest, "what if there's an important email that I need to act on urgently?" If email is a dog collar around your neck, then check work email on



your smartphone, and only take action on urgent matters. Make a habit of only checking email on the phone, which will make it easier to close the email app and get to real work. Do at least 45 minutes of real work before you open email on your computer. You might just find yourself sucked into that important task and ignoring email until much later, and that's a good habit to develop.

When all else fails, I like to repeat this mantra: "I do not get paid to answer email."

(Note: You may need to change the mantra if you do in fact get paid to answer email.)

Make a habit of only checking email on the phone, which will make it easier to close the email app and get to real work.

BELIEVING THAT MULTITASKING IS UNPRODUCTIVE

People who read about technology, tech culture, and productivity know that multitasking is unproductive.

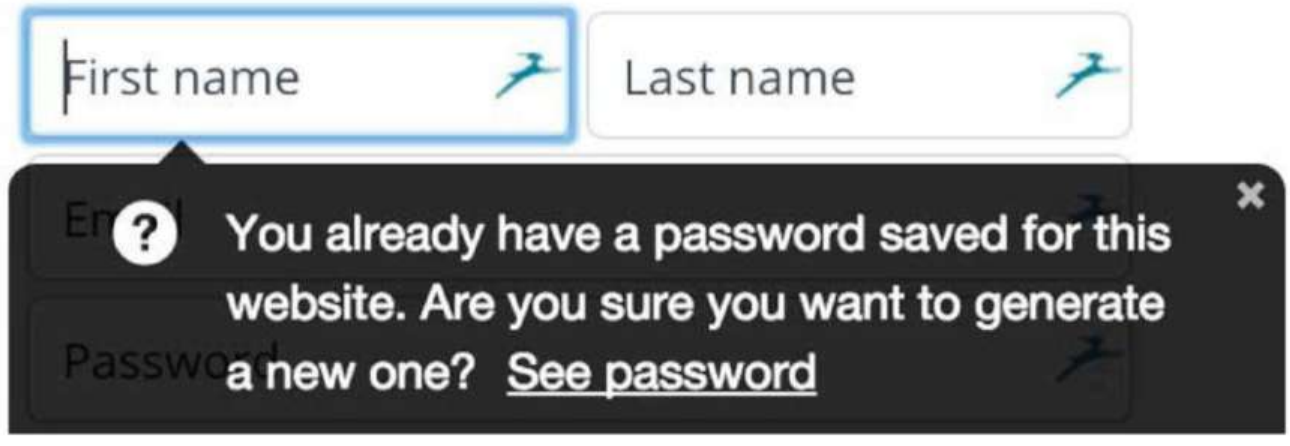
Well, sorry, but that's just not true.

Research on multitasking shows that it is very productive, but only to a point. When graphed, the value of multitasking has an inverted "U" shape. A little bit is good, but too much is just as bad as none at all.

Research also suggests that the value of multitasking varies based on the individual and type of work being done. Quite frankly, I believe most people know which of their tasks are suitable for multitasking and which are not. Stuck in a meeting that's not really relevant to you? Go ahead and catch up on email! Drafting a million-dollar proposal? You'd better focus on that task alone.

UNWITTINGLY CREATING DUPLICATE ACCOUNTS

How many times have you signed up for an online account, only to realize later that you already had one tied to a different email address? It's a common problem among early adopters who take great pride in signing up for new sites and services as soon as they become available.



Having more than one account can be a problem if you wasted time setting up the initial account. It's also a problem if you stored any data in that first account that you might need to have again.

The easiest way to avoid creating duplicate accounts is to use a password manager. Password managers manage your usernames and passwords, and, as a corollary benefit, they also keep track of whether you already have an account with any app, site, or service.

I personally test software and online services as part of my job. As a result, I have more than 450 online accounts. I would never be able to keep track of my online enrollments without a password manager. I use Dashlane, but LastPass Premium and Sticky Password Premium are also good options—and all three are *PC Magazine* Editors' Choice winners.

SCHEDULING MEETINGS WHEN YOU'RE SHARPEST

You like to be sharp during meetings, right? Unfortunately, unless meetings are the core of your job, scheduling meetings when you're at your sharpest is highly unproductive.

Like email, meetings are considered "work about work." The real work is what you do *after* the meeting. So it's best to schedule meetings during times of day when you typically slump, usually the afternoon, and protect your important hours for when you can tackle the tough stuff.

What does this have to do with being a tech enthusiast? If you're using all the latest connected calendaring solutions and scheduling tools (such as Doodle), then perhaps your colleagues and partners can see when you're free and when you're busy. It's easy for anyone to suggest meeting in the morning if that's the first time of day, chronologically speaking, when everyone is free.

So block off in your calendar whatever time of day you are at your peak. For most people, it's the first few hours of the work day. Label this time "focus work," or mark it private so people can see you're busy but don't know what you're doing. Blocking off productive hours will also steer you away from scheduling other unproductive things at this time, like doctor appointments. Save that stuff for times of day when you're burned out.

The Best Software for Learning Languages

BY JILL DUFFY

Learning a new language as an adult takes considerable time and effort, but having the right software or app to help you can make a huge difference. Of course, what the "right" program is for you depends on a number of factors, such as your previous exposure to the language, personal preferences, and goals—what works for some people might not work for others.

For example, are you trying to learn a few words for traveling, or do you need to be able to communicate with a business partner? Would you be thrilled to

learn a language using MP3s during your commute time, or do you need to sit down at a computer and focus without distractions for a half hour each day? Some people need strict guidance on what to study and how often. Other people like the freedom to jump around as they study, moving between reading passages and playing games designed to build vocabulary. Still others will get the most out of a program that lets them practice speaking and listening with real human beings.

Since 2011, I've tested dozens of programs designed to assist in learning a language, from the biggest and best-known products to free mobile apps made by independent developers. What follows are my recommendations, plus summaries that explain what kind of person is most likely to be satisfied with the software.

CRÈME DE LA CRÈME

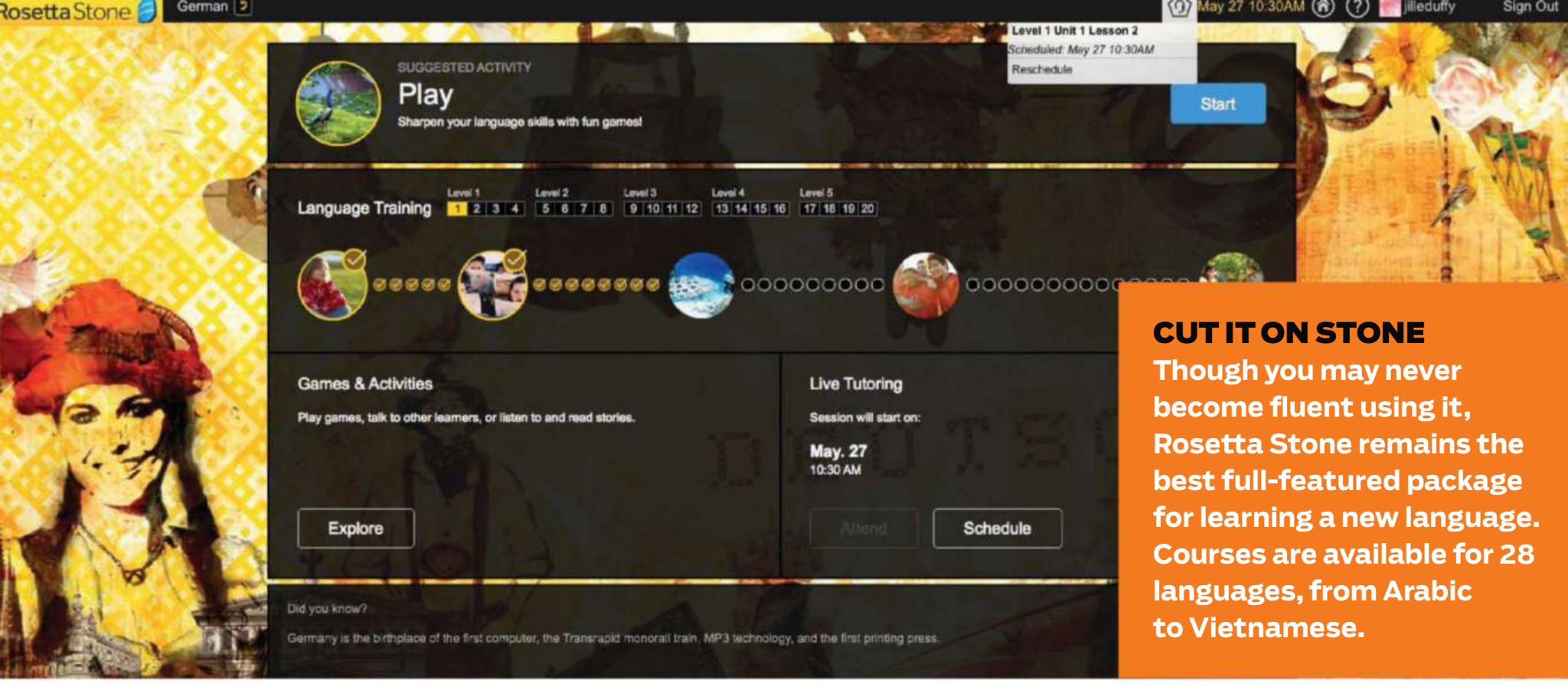
Of all the language programs on the market, two stand out as being the best all around, offering excellent instruction, supporting an array of languages, and delivering a well-structured learning environment: Rosetta Stone Language Learning ($179) and Duolingo (free).

THE PROBLEM WITH FREE TRIALS

It may seem as if the best way to find out which program is best for you is to use free trial versions of language learning software until you land on one you like. Certainly there are plenty of these available, but there are major problems with free trials.

For one, it takes time to try out language learning programs. There's a reason most trials are a week or longer: You need at least that much time just to get a sense of how the system works, and to progress through enough material to see something other than the entry-level exercises. You must commit to using the program for a week to make sure you're really seeing it for what it is.

Second, for however many programs you try and don't like, you end up knocking away one week of time that you could have spent actually studying the language and getting absorbed into a program. It could easily amount to a month or more of wasted time.



CUT IT ON STONE

Though you may never become fluent using it, Rosetta Stone remains the best full-featured package for learning a new language. Courses are available for 28 languages, from Arabic to Vietnamese.

Rosetta Stone has an excellent and stable system. Although some people may complain that the content is repetitive and a little dry, the deductive learning method it uses is much more memorable than, say, the flash cards that most other programs use as their primary learning mechanic. The software also keeps track of your progress, scores you as you complete exercises, and repeats important ideas at the right intervals to help you keep them fresh in your mind. It also incorporates reading, writing, speaking, and listening equally, and it has optional e-tutoring sessions in which you can take a class with a real instructor via Web conferencing.

Duolingo isn't as well known as Rosetta Stone, but its content is nearly as good, and it's completely free. It has full programs for ten languages, plus ten more in various stages of development. Expect a few bugs and errors if you participate in one of the beta programs, but if you stick to learning one of the finalized languages, you'll be very happy to use Duolingo to study and practice your skills every day.

BRUSHING UP

Rosetta Stone and Duolingo are the best programs for beginners, but if you've studied a language previously and are interested in brushing up your skills, you'll want something very different.

Transparent Language Online is really good for more advanced language students who are picking up their tongue again. It has a tough placement test that will find the right point in its online program where you should start, based on your existing skills.

Two programs that aren't quite at that level but still have something valuable to offer are Mango Languages and Yabla. Beginners are likely to struggle with

these programs, but they both offer something really helpful for more advanced students: videos.

Although Mango's core content is weak, it has a Premiere section where experienced speakers can watch an entire movie in French, Spanish, Japanese, or Mandarin Chinese with subtitles in that language and English. Then, in a follow-up section, you can walk through each scene's dialogue line-by-line.

Yabla teaches all its material through videos, which are too difficult for beginners but provide a fine way for more experienced speakers to listen to native speakers with a variety of accents.

If you want to study a language during your commute, Pimsleur is one of the best options.

SPECIAL FEATURES

A few programs on the market have special features that could make all the difference in your learning regimen.

Pimsleur Comprehensive, for example, is old-school in the sense that the programs are mostly MP3 files. There's no interactive component with games or voice recognition feedback. But if you want to study a language during your commute, Pimsleur is one of the best options. It also excels at teaching pronunciation, but on the flip side, you won't learn how to spell or read quickly with this program.

THE YOUTUBE OF LANGUAGE LEARNING

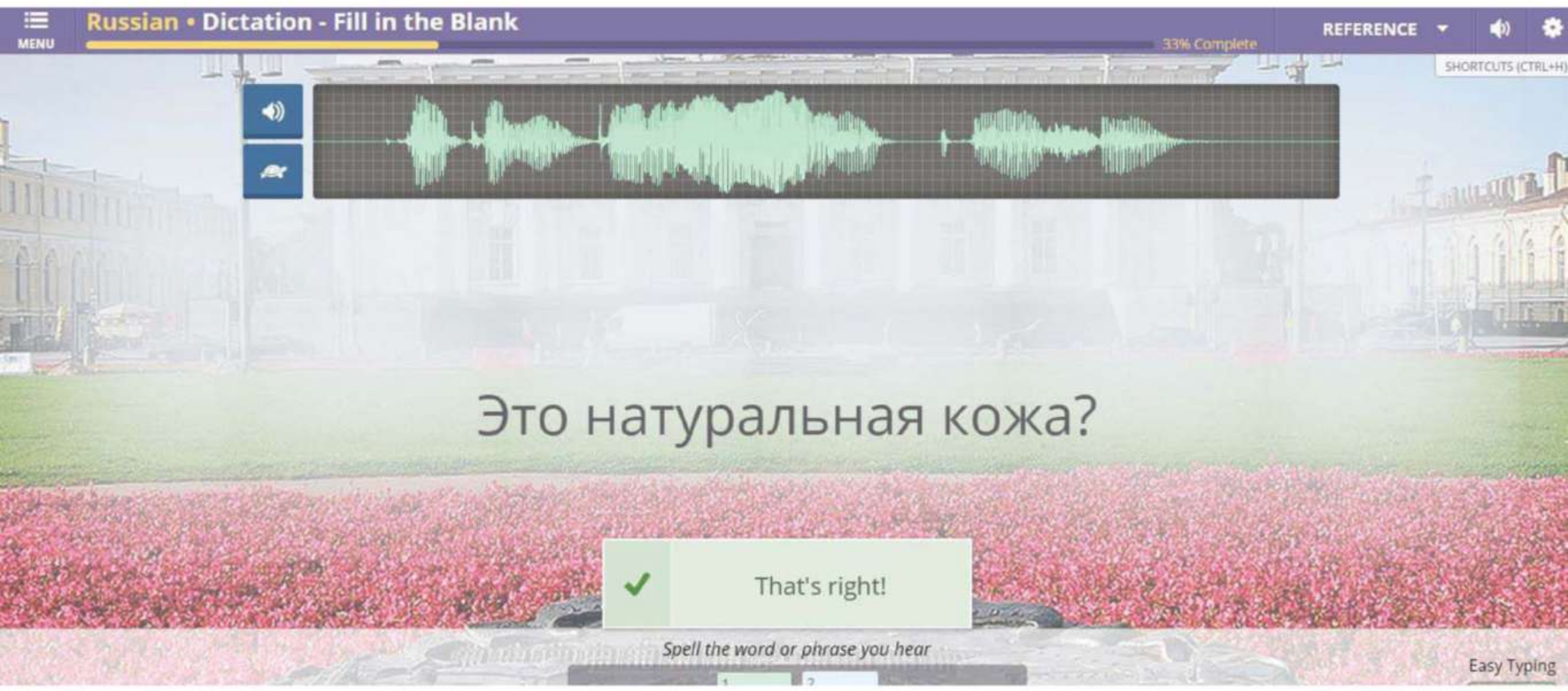
Yabla lets you practice your language skills by watching videos of native speakers. But because it's not a structured learning environment, it's not ideal for all students.

Then there's e-tutoring, or live classes held via Web conferencing. Rosetta Stone offers this feature, but classes are very tightly scripted. Living Language's e-tutoring sessions are better, and they're not expensive. If speaking with real people is how you learn best, but you can't get yourself to a physical classroom, Living Language might be your best option. Be aware, however, that not all languages have e-tutoring, though the most popular ones do.

BEGGARS CAN'T BE CHOOSERS

Most language programs can teach you Spanish, French, German, Italian, and Portuguese. But what do you do if you need to learn Igbo, Irish, or Indonesian?

The three programs most likely to have a hard-to-find language are Transparent, Pimsleur, and Mango Languages. Mango may be available for free through your public library, although I personally have had a better learning experience with Transparent and Pimsleur and recommend those above Mango.

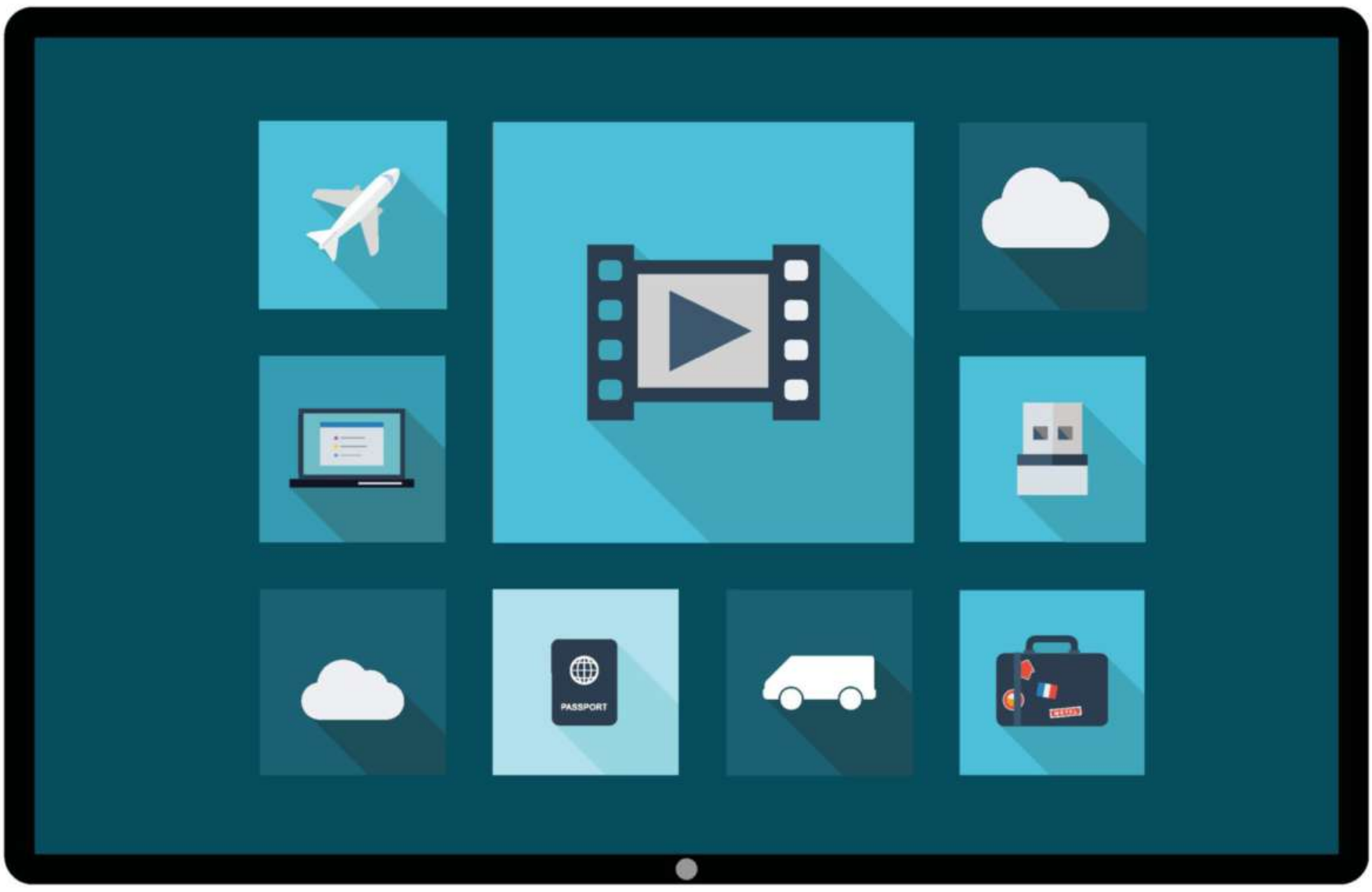


GET TALKING!

Most software-based language programs will help you learn a base of vocabulary and grammar, but they won't turn you into a fluent speaker. For that, you need to practice with other human beings and come up with things you genuinely want to say, rather than words that an app are prompting you to learn. Using any of these programs can teach you a lot, though, so develop a base knowledge first with them, and then go out and use your skills in the real world!

Traveling? Take Your Movies With You

BY SASCHA SEGAN



Streaming services such as Netflix, Amazon, and Sling TV are ideal for watching some of your favorite shows almost everywhere. But on the road they're less than reliable, because the Internet is often less than reliable. Cramming a bunch of downloaded movies onto your tablet, phone, or laptop is a network-proof solution, but you may not have the space.

The best of the major services from which to download media is naturally iTunes, as you can store its files anywhere. Movies you download from Google Play or Amazon must reside on your mobile device, which can be a pain if that device doesn't have expandable memory. But in that case, you can use your portable storage to clear out everything but those movie downloads.

We've selected some of our favorite storage solutions to make it easier to carry your media with you on your trip.

THE BEST PORTABLE STORAGE FOR TRAVELERS

If you're lucky enough to have a device with a microSD card slot, the SanDisk Extreme 64GB ($199.99) is our pick for the best balance between price and performance. If you can find the faster Extreme Plus or Extreme Pro for the same price, you might as well get them, but the performance difference was marginal on most phones and tablets when we tested all the cards.

Just want more space on your laptop? Flash drives are cheap nowadays. For instance, you can pick up the reliable SanDisk Ultra Fit 64GB for $24 on Amazon, and there's a PNY 128GB drive at Amazon for $31, although it may not be as reliable.

The new SanDisk Connect Wireless Stick ($99.99 for 128GB) is the next step up. Load it up with files using your laptop, and you can then play your (unprotected) stored media on any device with a Web browser, including phones, tablets, and laptops. The major down side here is that it's difficult to stream your videos to non-smart TVs without USB ports. Fortunately, many recent TVs have USB ports.

In situations where wireless connectivity may be difficult, such as on airplanes, the Kingston DataTraveler MicroDuo 3.0 pays off. This super-affordable ($24!), tiny 64GB flash drive plugs into your laptop to offload files, and then plugs into your smartphone or tablet with its micro USB connection so you can play the files. Have a new computer with a USB-C port? The DataTraveler microDuo 3C costs just $3 and supports both the next-gen port and its older counterpart.

The iPad-compatible equivalent is the SanDisk iXPand, with its Lightning connection, although it's also more expensive—$99.99 for 64GB. PhotoFast's MemoriesCable combines a flash drive and a charging/syncing cable for your iDevice; it's priced similarly to the iXPand.

To carry your full media library with you—and to store it when you're home—use the LaCie Fuel. This 1TB portable hard drive acts as a full Wi-Fi router and media server. Even better, you can hook it up to a TV using a Roku Streaming Stick, although the instructions are a little painful and involve also having a smartphone.

GET IT ON THE TV

What if you have the media with you, but it's just on too tiny a device for your whole family to enjoy?

Many hotels (like the Delta Toronto, for instance) now allow you to plug your device directly into the room TV's HDMI port. Depending on the phone or tablet, that might involve the Apple Lightning Digital AV Adapter, a SlimPort adapter or an MHL adapter, plus a cheap HDMI cable from Monoprice. For laptops, that may be just an HDMI cable, or an HDMI adapter. Don't assume the hotel has one; pick it up online in advance.

If you're staying in a vacation apartment or house, feel around the back of the TV for a USB port; there might be one there, and many current TVs play a range of unprotected video formats straight off of USB sticks or portable hard drives. The Roku Streaming Stick, mentioned above, will also plug into a TV's HDMI port and let you stream video from your laptop, tablet, or phone using the Roku app.

If you can't get to the TV, a projector can turn any surface into a big-screen TV. That's especially good for camping or for parties. The pocket-sized Celluon PicoPro ($349) can project images from your smartphone, but for a full traveling entertainment solution, nothing beats the ZTE Spro 2 ($399), which runs Android and has its own LTE connection and a microSD card slot, so you can play local or streaming video directly from the device.

Only the truly geeky should look at Android TV sticks. These sticks plug directly into a vacation-home's HDMI TV input and play media from a microSD card, turning any TV into a smart TV. They're best only for Android enthusiasts, however: They're typically buggy and difficult to use.

Retro Gaming That's Still Got It

BY MATTHEW MURRAY

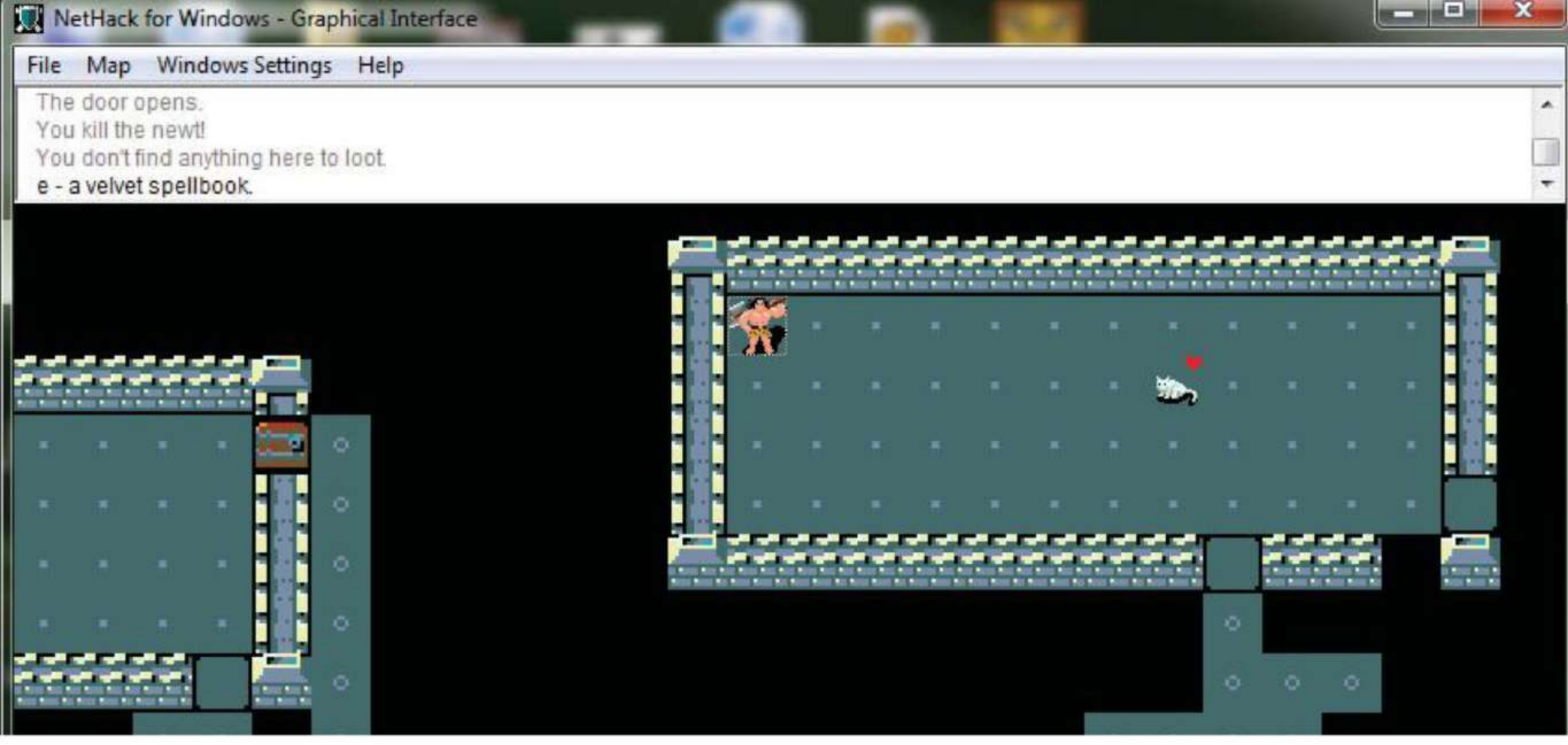
I marked the solemn occasion of the 80th anniversary of the bombing of Nagasaki near the end of World War II in an unusual way: I actually went to Nagasaki—in 1945. I met a young Japanese girl there moments before the "Fat Man" bomb dropped, but escaped just in time—all because I'd given her an umbrella inscribed with the words "All prams lead to Kensington Gardens" in exchange for a paper crane.

Okay, maybe it wasn't *quite* our world, but it was close. I was exploring the universe of Trinity, the 1986 all-text adventure published by Infocom. Trinity still thrills, and for exactly the same reason that the game itself now appears so unquestionably of its time: Brian Moriarty's poetic treatise, a cry for sanity in an increasingly armed and angry world, was built on words and eternal ideas that cannot tarnish. They remain powerful and adult even as the CGA and EGA graphics that defined the era's state-of-the-art game releases now look ridiculously passé.

Thanks to the iOS app The Lost Treasures of Infocom, you can now easily relive Trinity and dozens of other timeless Infocom releases on your mobile device, just as I did. Your no-cost download nets you the timeless underground treasure-hunt romp Zork I, along with full maps, hints, and even high-quality scans of the game's in-box "feelies," which offer additional atmosphere, humor, and insight you can't get from most games today. A $9.99 in-app purchase buys you 25 more Infocom games (again, all with the full manuals and extras, but not the hints—those will run you another buck) that span a dizzying variety of genres from fantasy to mystery to sci-fi, and difficulty levels from after-school snack to hair-pullingly challenging. Whatever your taste in interactive storytelling, it can be sated here.

The app streamlines playing, too. You can use a pop-up compass rose to move between rooms, configure macro icons for commonly entered commands, or rely on the built-in predictive text function so you type only what you have to; and maps, answers, and documentation are never more than a tap away. You'll still need your imagination, wits, and in some cases patience, but these design features are a huge help if you don't have a physical keyboard handy. You shouldn't expect the experience to be perfect—the documentation scans are occasionally hard to read or incomplete, the "hint books" contain glaring omissions or typos, and the organization of the resources can leave something to be desired—but for a computer gaming history lesson, there's nothing better.

There are a few other excellent options out there for playing high-quality, old-school games, which, like The Lost Treasures of Infocom, still offer plentiful entertainment today.



Say, for example, that instead of cracking open the electronic equivalent of a book, you'd prefer some monster-bashing action. The 1980 Unix-based dungeon-delving game Rogue has birthed dozens of variants that are still widely played today. And for good reason: Sometimes you just want to hit a kobold with a sword and steal his riches. Among the so-called "roguelikes," the kings remain Angband (rephial.org) and NetHack (nethack.org). These two totally free games (and their myriad, similarly named variants) use simple graphics—traditionally, they've been played with ASCII characters, though in recent years beautiful tile-based graphics sets have become standard additions—but pack big, addicting fun.

Angband is heavily inspired by the J.R.R. Tolkien legendarium, taking its title from the fortress of the evil Morgoth as described in *The Silmarillion*. In it, you roll your character from a variety of races (human, half-elf, dwarf, and so on) and professions (warrior, mage, rogue, and more), allocate his or her attributes, and then set off in search of Morgoth, who lives 5,000 feet beneath the ground in a menagerie of nasty creatures and deadly traps. You'll amass untold fame and fortune, but you'll also risk not coming back out alive.

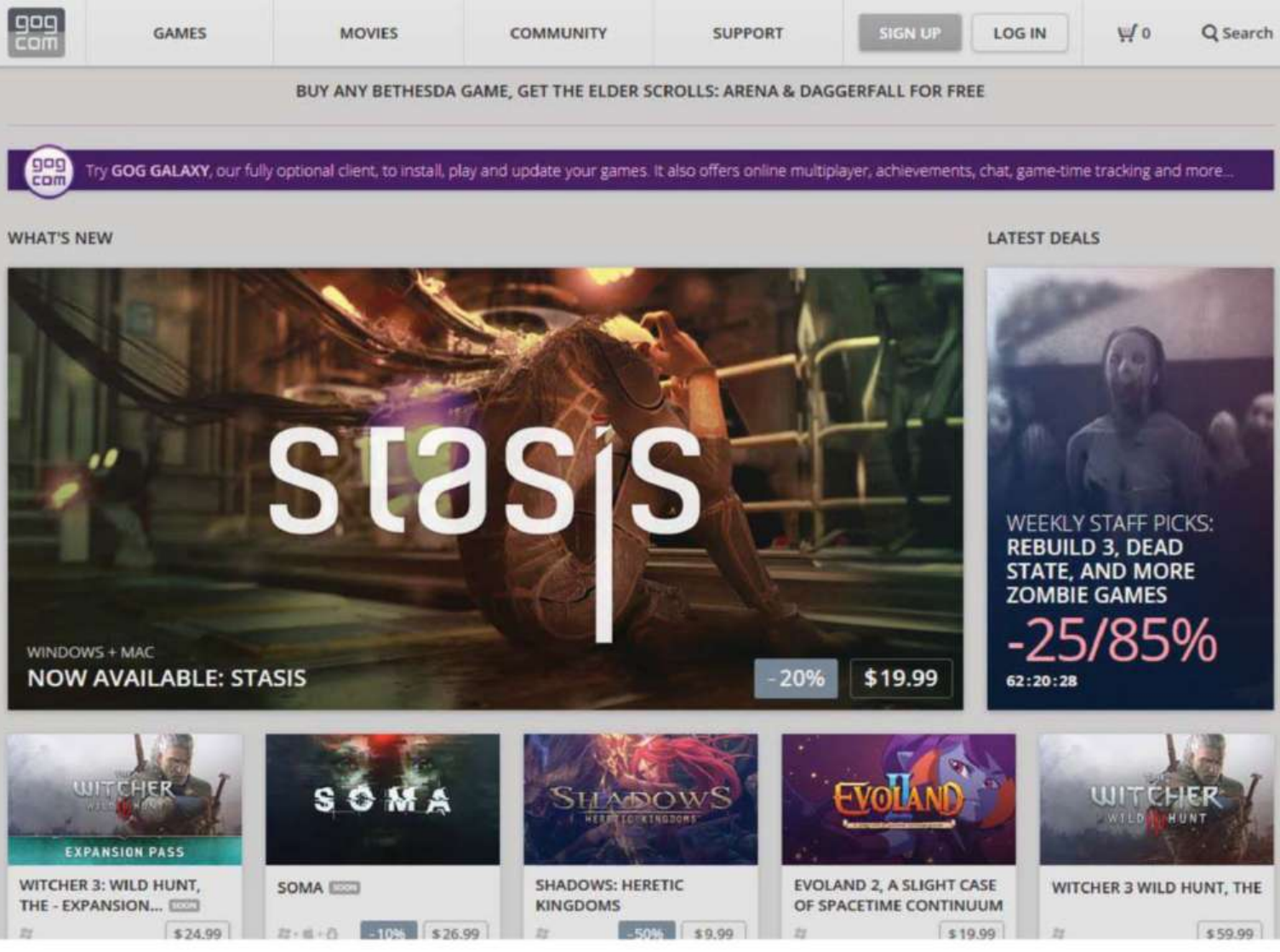
Even more inventive and surreal is NetHack (pictured above), which greatly expands the same basic idea. Your quest is to find the Amulet of Yendor and offer it up to your deity, but there are countless ways to surmount the obstacles you'll encounter along the way. Think an item or a piece of scenery can't be used as a weapon, kill you, or solve some other wacky problem? Think again. Infinitely rewarding yet infinitely complex, NetHack celebrates both hacking and slashing and creativity, and can be conquered in millions of unique ways. Even more than with Angband, each and every game is wildly surprising.

If you're familiar with the contemporary incarnations of the roguelike concept—Torchlight, say, or Diablo—you might not be prepared for how lengthy and difficult these games are. Though how well you can swing a sword or fling a spell is important, strategy is even more crucial. If you want to survive over the weeks or months it may take to succeed, you'll need cunning and careful strategizing more than you will quick fingers. And did I forget to mention all death is permanent? One wrong move and you could lose it all, with no hope of recovery. Slow is the only way to go, but boy, can it be satisfying.

Know you want to play something vintage, but you're not sure what? Check out GOG.com. This online distribution center boasts hundreds of games in every conceivable category, most of them from the early 1990s forward (though some are from even earlier), all completely DRM-free and nearly all of them at reasonable prices.

GOING ROGUE

Roguelike games like Angband offer nonstop action, lengthy playtimes, and serious intellectual engagement, provided you're willing to put up with distinctively downscale graphics and interface design.



Pick up Sid Meier's Alpha Centauri—widely considered the best of the Civilization-style games—and its add-on packs for just $5.99. Nab the first six of Sierra On-Line's groundbreaking King's Quest games for less than $20. If you're on an Origin kick, get all four of the pulse-pounding space fighters in the Wing Commander series for less than $18, or the complete 14-game Ultima collection for $35.94—that's an astonishing $2.57 each, for literally hundreds of potential hours of gameplay.

There are a couple of caveats with GOG.com. It's generally best if you know what you're looking for, and because nearly every game on it was designed for older computers and operating systems, not everything may run effortlessly. But if you can work around these problems, you'll find few better sources for some of the best games the industry has ever produced.

Whether you want to relive classic games, discover them for the first time, or introduce them to a friend or family member who may have missed them, these methods are wonderful ways to pass on vital gaming history that all too often is lost (or discarded) easily these days.

There may be a bit of adjustment, given how good graphics and sound are today, but once you jump in you'll be stunned at just how much these titles have to offer. Given that American tensions with Russia are again flaring and most of this past summer was consumed with the question of whether Congress will approve a nuclear deal with Iran, Trinity is once again looking pretty timely. And it's only the beginning of what's out there.

JOHN C. DVORAK

A Surveillance State In Disguise

In many EU countries, entire herds of cattle are carefully "microchipped" so the animals can be monitored. What if we did the same to people? It would be difficult to become a criminal or (gulp) a terrorist! Obviously, nobody is going to allow that to happen. For now, we'll just have to track our dogs, though our phones already track us quite a bit.

We can get still closer to 24/7 surveillance of everything we do with the implementation of the Internet of Things (IoT). There seems to be no outcry or even a single expression of concern over the fabulous notion that every item that can be given an IP address and monitored over the Internet *will* be given an IP address and monitored over the Internet. The rationale for this has always been sketchy. So you won't run out of milk?

Nobody recognizes that this is just more of the same surveillance state encroachment that was first enabled by the Internet and was already out of control before the IoT came along. Who is going to benefit from the data accumulated by, for example, the Apple Watch and other tracking devices? Law enforcement? The NSA? The president? None of the above?

In most instances, the beneficiaries will be the insurance companies. They are the ones that gobble up big data. But personal data would be better. It would be fantastic for a life insurance company to be able to adjust your policies by knowing how many steps you take a day, your heart rate, or caloric intake.

Most of your personal health information is protected by law. But this sort of information is protected by nothing except your own ability to keep things private. From the looks of it, most people don't care about that because they don't see any of it as a personal threat. Of course, they might sing a different song if their insurance was canceled after a black box revealed they were driving too fast, or an activity tracker found they were too sedentary or eating too many corn chips.

With the IoT, everything will be monitored, from your bad taste in music and your love affairs to your gambling habits and your carelessness about turning off the lights in the house, not to mention eating and drinking habits, the pencils you steal from work, the time spent in chat rooms, Internet downloads, the political commentary you make anonymously, what you watch on TV and how long, all your affiliations, every photo you take, how much energy you waste, and how much air you breathe. You name it.

Nobody seems to think any of this is a bad idea. It's all seen as an improvement. Tech is great. The IoT is fantastic. We may as well give up and let the authorities "chip" us like cattle. At least we'll know where we stand. Then again, it may work better to sneak up on us all. Sell this as a great future vision for a prosperous new world.

The IoT is going to be glorious. Though, personally, I'd keep a close eye on anyone promoting this kind of future.

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